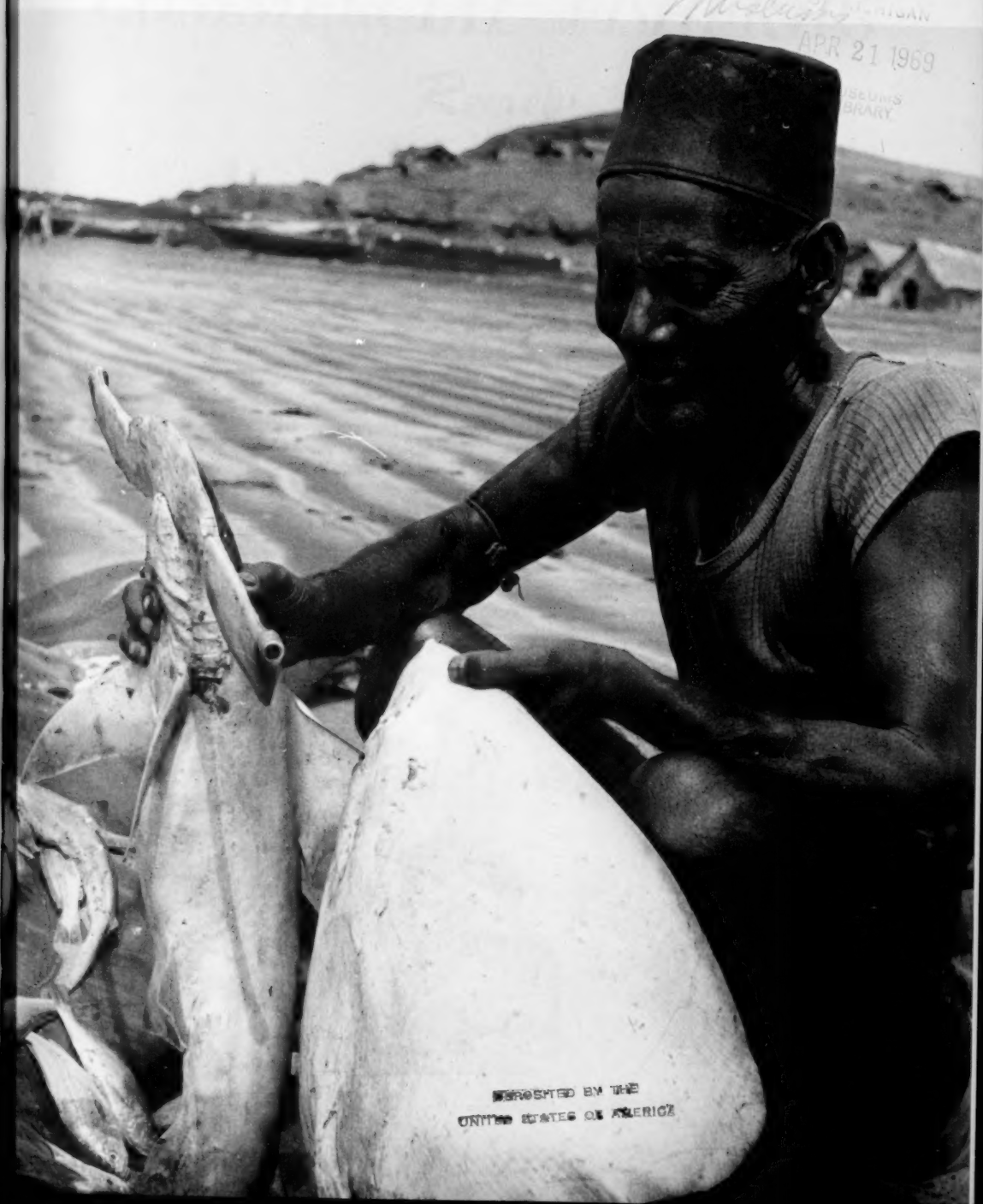


COMMERCIAL FISHERIES *Review*

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COVER: Indian fisherman holds hammerhead
shark (left) and ray. (FAO/T. S. Satyan)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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A 14-tooth 'Fall River' clam dredge rigged with an accumulator-chain modification--used for exploratory fishing by R/V 'Silver Bay' off North Carolina.

(Photo: J. B. Rivers)

U.S. FISH CONSUMPTION IN 1968 WAS HIGHEST SINCE 1954

The average American ate more fishery products in 1968 than he had in any of the preceding 14 years. The per-capita consumption figure was 11.1 pounds, edible weight--0.4 of a pound more than the 10.7 of 1967. Retail prices averaged 2% more.

The rise in fish consumption heartened some industry observers who had waited impatiently for the first hard evidence with which to measure the impact of the ending of "meatless Friday" by the Catholic Church in early 1967.

How 11.1 Was Divided

Of the 11.1 pounds, fresh and frozen fishery products totaled 6.2 pounds, a rise in this category over 1967. Most of the increase was in fresh fillets and frozen fish sticks and portions. U.S. production declined for haddock, halibut, ocean perch, tuna, king crab, and blue crab.

Canned fishery products were an estimated 4.4 pounds per capita, a slight increase over 1967. There were large increases in the canned packs of salmon, Maine sardines, and California mackerel--and slight increases in shrimp, oysters, and anchovies. Imports of canned products rose slightly.

Completing the 11.1 pounds was one-half pound of cured fishery products, virtually unchanged from previous years.

Over 2 Billion Pounds

The use of fresh and frozen fish and shellfish was estimated at 1,224 million pounds--about 66 million pounds greater than in 1967.

Use of canned seafood was estimated at 870 million pounds--30 million pounds higher than in 1967.

U.S. Position Has Changed

In less than 20 years, the U.S. has changed from an overall domestic producer to a net importer of fishery products. The U.S. is the world's largest importer and may have the largest market for aquatic products.

In 1968, U.S. fishermen could produce only 40% of the Nation's needed supply of edible fishery products--and about 15% of its needs for industrial fishery products.

More U.S. Supplies in Future

In the future, more supplies of fishery products are expected to come from still-undeveloped U.S. fisheries; a scallop fishery off the South Atlantic Coast and another off Alaska--and shrimp resources off the Pacific Northwest and New England.



UNITED STATES

Forecast Abundance of Groundfish & Sea Scallop on New England Banks

The abundance of groundfish and sea scallops fished by New England fishermen has been forecast by BCF's North Atlantic Region. The forecast is based on information provided by biologists of BCF's Woods Hole Laboratory. They monitor landings of commercial fishermen and study populations of fish and shellfish on offshore banks by sampling from the 'Albatross IV.'

Haddock landings in New England dropped from 98 million pounds in 1967 to 71 million pounds in 1968. There were fewer fish, primarily on Georges Bank. Natural causes and heavy fishing by foreign fleets in 1965 and 1966 were to blame. Recovery of these depleted stocks is not expected within the next two years.

The annual fall groundfish survey of the Albatross IV revealed a very poor 1968 year-class of haddock, the fifth consecutive one. (The last good year-class was in 1963.) As a result, abundance will continue to decrease during 1969 and 1970 because Georges Bank haddock do not reach marketable size before they are two. On Browns Bank, where the 1963 year-class has been important during the last few years, haddock abundance is expected to decrease. There has been no strong year-class there since 1963.

Cod

Cod landings in New England in 1968 were 48 million pounds, 4 million pounds above 1967. Georges Bank cod abundance was slightly higher in 1968 than in 1967. The Albatross IV groundfish survey indicates an increase in young-of-the-year cod, as in 1967. So a slight increase in abundance is expected for 1969.

Whiting

Whiting landings for food increased from 60 million pounds in 1967 to 72 million in 1968. Abundance increased slightly over 1967. Abundance on Georges Bank was somewhat lower, but increased considerably in

Gulf of Mexico. Higher landings in 1968 resulted from increased fishing in Gulf of Maine. Whiting abundance probably will not change markedly in 1969.

Yellowtail Flounder

Yellowtail flounder landings in 1968 were 65 million pounds, 13 million above 1967. This increase resulted from greater abundance due to relatively strong 1964 and 1965 year-classes. Later year-classes are not quite as large, and 1969 abundance is expected to be the same or slightly lower than in 1968.

Ocean Perch

Ocean perch (redfish) landings were 63 million pounds in 1968, compared to 71 million pounds in 1967. Although abundance increased on all ocean-perch grounds during year, low fishing effort resulted in the catch decrease. The 1969 landings will depend largely on market demand.

Industrial Fish

Industrial red hake and whiting catches from southern New England grounds were 22 million pounds in 1968 and 20 million in 1967. Abundance in 1968 was somewhat higher than 1967; abundance in 1969 is expected to be the same or slightly higher than 1968.

Total southern New England industrial fish landings (all species) by otter trawl were 76 million pounds--2 million lower than 1967. This was due to decreased fishing effort because abundance of industrial fish species increased slightly in 1968. This abundance level is expected to continue through 1969.

Sea Scallops

Sea-scallop landings were 9 million pounds of meats in 1968, 8 million in 1967. Of the 9 million, 2 million were from Georges Bank, and 7 million from Middle Atlantic grounds.

Georges Bank landings in 1968 were about the same as in 1967, while Middle Atlantic landings were up 1 million pounds. Abundance of sea scallops on Georges Bank decreased in 1968; a further decrease is expected during 1969.



Sealskin Harvest

The 1968 harvest of Pribilof fur sealskins was shipped by rail to the processor during January 1969. The U.S. share of the harvest was 40,970 skins (533 barrels), and the Japanese Government's share was 8,781 skins (116 barrels). Total blubber production was 476 barrels, consisting of 6 barrels for the Canadian Government, 28 barrels for Japan, 130 barrels to be used in processing the U.S. skins, and 312 barrels bought by the Fouke Company.



5 of 6 U.S. Fishing Vessels Have Electronic Equipment

In 1967, there were 11,021 fishing vessels in the U.S. 5 gross tons and over, according to the Bureau of Customs. Five of 6--9,403 vessels--had some electronic gear. Loran, a long-range, radio direction finder, was aboard 2,767 vessels. The rest had less sophisticated, but useful, navigational equipment.



Ferro Cement Fishing Boats Are Being Built

Two cement fishing vessels are under construction at the Marine View Boat Building Co. in Tacoma, Wash. A 32-foot troller was recently launched. Under construction, upside down, is a 50-foot combination fishing vessel for a Sitka, Alaska, fisherman.

These are the first ferro cement fishing craft to be built in the Pacific Northwest. Because of low cost and speed of construction, this may set a trend in fishing-vessel construction. The hull is formed of 1-inch thick cement reinforced with steel webbing. This material has another advantage: there is virtually no maintenance cost because cement is free of rust and impervious to destructive marine organisms.



Groundfish Fillet Import Tariff-Rate Quota Set for 1969

The reduced-tariff-rate import quota on fresh and frozen groundfish (cod, haddock, hake, pollock, cusk, and ocean perch) fillets and steaks for 1969 is 26,465,631 pounds. This was announced by Bureau of Customs in the Feb. 15, 1969, "Federal Register." Divided into quarterly quotas, this means that 6,116,407 pounds of groundfish fillets and steaks may be imported at the $1\frac{1}{2}$ cents-per-pound rate of duty, and any imports over the quarterly quota will be dutiable at the rate of $2\frac{1}{2}$ cents a pound.

Reduced-Tariff-Rate Import Quota for Fresh and Frozen Groundfish Fillets, 1955-1969

Year	Quota	Year	Quota
	1,000 Lbs.		1,000 Lbs.
1969	26,466	1961	32,601
1968	24,895	1960	36,533
1967	24,883	1959	36,920
1966	23,591	1958	35,892
1965	24,384	1957	37,376
1964	24,862	1956	35,197
1963	24,875	1955	35,433
1962	28,571		

Quota Higher Than 1968's

The reduced-rate import quota for 1969 is up from the 1968 quota of 24,894,900 pounds. From 1951 to 1960, the quantity of fresh and frozen groundfish fillets permitted to enter the U.S. at the reduced rate of duty of $1\frac{1}{2}$ cents a pound had increased 24.7 percent. In 1961, however, the trend was reversed significantly for the first time. This occurred because in 1960 frozen fish fillet blocks with bits and pieces were no longer dutiable under the Tariff category of "frozen groundfish fillets."

Kennedy Round

U.S. concessions granted in the 1964-67 trade conference (Kennedy Round) at Geneva reduced the rate of duty on fish blocks (with bits and pieces) from 1 cent a pound to 0.8 cent a pound on Jan. 1, 1968, and 0.5 cent a pound on Jan. 1, 1969. Concessions on fish blocks are being put into effect in 5 annual stages; the final reduction will become effective Jan. 1, 1972, when fish blocks will be made duty free.

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Crab and Shrimp Pasteurization Lengthens Their Storage Life

The report of an EDA-financed study shows that pasteurization can extend the low-temperature storage life of Dungeness crab and shrimp. The study was conducted at the Seafood Research Laboratory, University of California San Francisco Medical Center.

The Findings

The researchers found that shrimp and crab meat can be pasteurized in boilable plastic pouches at 82.2° C. (180° F.) for 5 minutes (center temperature). This extends by about 50 days the storage life at 1.1 to 4.4° C. (34 to 40° F.).

The incidence of potential pathogens on commercial shrimp and crab meat is low--but these bacteria were able to grow. In some cases, these bacteria produce toxin over a relatively wide temperature range. While no *Cl. botulinum* was found in the 128 samples tested, the probability of this organism surviving the pasteurization process still exists.

The researchers conclude that pasteurization of shrimp and crab meat is a feasible and potentially useful procedure. But, for safety sake, the pasteurized products should not be stored at temperatures above 2.2° C. (36° F.).



Southeastern Fisheries Association Meets June 13

The Southeastern Fisheries Association and its subsidiary, the Florida Shrimp Assoc., will hold their 17th Annual Convention in Tampa, Florida, at the Manger Motor Inn, June 13-16, 1969.

A boat and equipment show is planned. Members and guests will be able to visit BCF's 'Oregon II', scheduled to tie up at the Inn for a day or two.



EDA Funds Help Sea Industries Study

The Commerce Department's Economic Development Administration (EDA) has made available \$143,220 to help determine the feasibility of cultivating oysters, fish, and fishing worms on the Lummi Indian Reservation in Washington. The study will demonstrate whether scientific production of the three sea products in the 5,000-acre estuary bordering the reservation can become a stable source of income for the tribe.

The resources of fish and shellfish in nearby waters--Bellingham Bay, the Strait of Georgia, Hale Passage, and the Nooksack River--are the only potential source of income. The tribe says the reservation lands are unsuitable for farming, and industrial jobs developed in the area recently have not benefited its members.

650 Jobs Possible

The tribe expects about 650 jobs to result in worm, oyster, and fish culture. Additional jobs would be created in processing, distributing, and marketing the products.

Scientific research on methods of production and environmental factors will be conducted in Federal and State cooperating laboratories and the Lummi Island Laboratory. The latter is sponsored by Western Washington State College of Bellingham. Indian trainees will aid in the research. In addition to EDA funds, the applicant, Lummi Business Council, is providing \$288,000 from other sources. The Bureau of Commercial Fisheries and Sport Fisheries and Wildlife will furnish some equipment, fish egg stocks, facilities, and technical advice for the study.



Lobster Tagging Produces Interesting Information

The lobster research program of BCF's biological laboratory at Boothbay Harbor, Maine, is paying off. In 1968, 2,634 lobsters were tagged and released offshore in the Gulf of Maine; 76, 2.9%, have been recaptured.

Of the 66 fully documented recaptures, 29% had migrated less than 10 nautical miles, 45%

between 10 and 50 miles, and 26% over 50 miles. The lobsters moved both north-south and east-west.

Released In 80 Fathoms

The tagged lobsters were released in an average of 80 fathoms. From April-November 1968, the lobsters recaptured were in an average of 57 fathoms; from November 1968-mid-February 1969, the average was 153 fathoms. These data support hypothesis that offshore lobsters move into shoal water during spring and summer--and return to deep water in fall and winter.

Molting and Growth

Thirteen of the lobsters returned to the lab had molted. Growth increments ranged from 12.4% to 20%; the average was 16.7%. Average growth increment for 'inshore' lobsters is 12-13%.



Thread Herring Schools Detected at Night

Schools of thread herring have been detected at night in the Gulf of Mexico by BCF's Pascagoula (Miss.) Exploratory Fishing and Gear Research Base. During test flights in January 1969, aboard U.S. Coast Guard aircraft, base personnel detected more than 80 large schools.

The Equipment

The night-vision equipment consists of an image intensifier developed by the Army, closed-circuit TV, and a video-taped system.

The image intensifier can amplify available light 55,000 times. It can be used to locate fish schools at night from altitudes of at least 5,000 feet.



Drift Bottle Found After 7 Years

A sealed beer bottle that was set adrift in the Pacific in 1961 by BCF's Biological Laboratory in Honolulu, Hawaii, has come ashore after more than 7 years and 10,000 miles in

the ocean. The bottle was recovered at Cannon Beach, Oregon, in January 1969. It had traveled a straight-line distance of 3,090 miles. A BCF oceanographer, however, estimated the actual distance as 10,000 to 12,000 miles.

The Honolulu lab also has used cards in plastic to study surface currents of the central Pacific.



Fishermen Shown How to Construct Trawl Economically

An expert from BCF's Seattle (Wash.) Exploratory Fishing and Gear Research Base, Jerry Jurkovich, recently lectured and demonstrated to fishermen the most economical method of cutting and tapering webbing in the construction of trawls. The project was organized in cooperation with the Oregon State University's Extension Service.

This was the Seattle Base's first effort in its Aid-to-Industry Program to talk to groups of fishermen on more efficient methods of fishing and gear construction. The response was considered excellent: 40-45 fishermen attended at Astoria, 20 at Newport, and 20 at Coos Bay.



BCF Scientist Honored by Wildlife Society

Dr. Stanford H. Smith, a Senior Fishery Research Biologist in BCF's Biological Laboratory at Ann Arbor, Michigan, received the annual Fisheries Publication Award of The Wildlife Society in Washington, D. C., on March 3.

He was honored for his paper, "Species Succession and Fishery Exploitation in the Great Lakes," which appeared in the "Journal Fisheries Research Board of Canada," in 1968.



BCF Scientists Assess Effect of Oil Spillage in Santa Barbara Channel

On Jan. 30, 1969, Union Oil Alpha Drilling Tower, located 3 miles offshore from Santa Barbara, Calif., began leaking crude oil at a rate of about 20,000 gallons per day. The leak continued, on and off, to the end of February, when this report was written, despite all efforts to halt it. A total spillage of perhaps 5,000,000 gallons was spread over the Santa Barbara Channel, including 30-40 miles of coastline, and the offshore island of Anacapa.

The most obvious biological effects of the spillage were on the nearshore fauna of the kelp beds, the intertidal zone (where State and university ecologists were actively working), and on marine birds and mammals. BCF-La Jolla decided that a short cruise of its 'David Starr Jordan' would be mounted by staff of the Fishery-Oceanography Center to investigate effects on the offshore pelagic ecosystem, primarily to determine if reduced viability of fish eggs and larvae could be detected.



(Photo: George Mattson)

Investigation Plan

The scientists hoped to detect the effects of oil pollution on pelagic fish eggs and larvae in two ways: 1) By a direct and rapid series of observations of unpreserved material taken from plankton hauls in water covered, or recently covered, with floating oil, oil-detergent mixtures, or both; the viability of the material would be compared with plankton samples taken as controls outside the oiled areas. 2) By comparing the viability, specific and age composition of pelagic eggs and larvae from samples taken under oil with data from a long-time series available for nearby CalCOFI station no. 83.40.

It was also hoped to observe effects of oil cover on: phytoplankton and microzooplankton; near-surface oxygen and nutrients; and light transmittance. Part of these objectives were to be the responsibility of ecologists from Scripps Institution of Oceanography, who participated in the cruise with Bureau scientists led by Dr. Paul Smith.

Jordan In Action

Jordan was in the polluted area on Feb. 11, 1969. The scientists first made a visual reconnaissance at Alpha Tower of light transmittance. Beneath primary slicks of brown crude oil, before they had aggregated to tar or spread to the iridescent form, ambient light at about 2 m. below the oil was only 0.3. This was 10% of what it was at the same depth below clean water just outside the slick, so light absorption by floating crude oil appears to be extremely high. This is an important factor to remember in phytoplankton ecology where such cover remains *in situ* for long periods (Fig. 1).

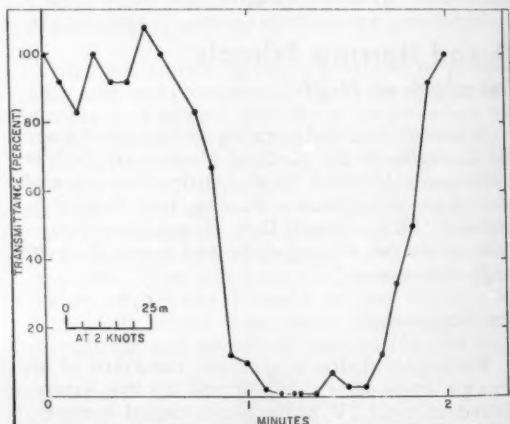


Fig. 1 - Light transmission under crude oil.

Pump samples of phyto- and microzooplankton were taken by Andrew Soutar of Scripps Institution. He reports that phytoplankton counts were significantly lower than at a nearby station in January. The present low values were repeated at a series of pump stations taken right across the Santa Barbara Channel.

Analysis of near-surface nutrients of water taken from under the oil slick (nitrite, nitrate, silicate, and phosphate) showed no

apparent differences when compared to samples taken from nearby clear water. Dissolved oxygen readings, however, were significantly lower under the heavy oil slick than in clear water. The importance of this difference may be as an indicator of a trend--rather than having immediate physiological importance to marine organisms.

A series of 6 standardized zooplankton tows were taken in polluted locations. The oil was cleared by a fire pump in order to lower and retrieve the nets. A control series was taken in clean water.

Findings

Examination of the eggs and larvae of fish sorted from the samples from polluted water indicated (1) no gross evidence of dead or deformed larvae or eggs, and (2) no gross departure from the expected specific composition of the ichthyoplankton at CalCOFI station 83.40.

At this station, the long-term (3 10 years) ratio of anchovy eggs: anchovy larvae is 1: 0.65, while this ratio in the 6 polluted samples was 1: 0.78. This indicated no apparent increase in mortality over normal.

The oil leak began on January 30 and more than 2% of all larvae in the polluted series of samples were spawned before that time. This is a normal percentage of older larvae (> 7 mm.) for unpolluted samples.

In addition to anchovy larvae, there were 33 hake larvae (*Merluccius productus*) between 2.0 and 5.5 mm, 46 *Sebastes* spp. (rockfish) larvae between 4.0 and 5.5 mm; 659 *Cynoscion* sp. larvae (a sciaenid); 9 *Citharichthys* spp. larvae (a sand dab); 9 *Parophrys* sp. larvae (English sole); 7 *Leuroglossus* sp. (deep-sea smelt); and 1 *Pleuronichthys* sp. larva (a flounder). These are the expected species in about the expected numbers for samples in this area.

Investigation to Continue

In assessing these results, it must be remembered that oil slicks move downwind much faster than the water some meters below the surface in which most eggs and larvae occur. Further, there are considerable tidal and other currents in the area. Because a larva some days old is taken below floating crude oil does not necessarily mean that it

has been there very long. It is extremely difficult to measure pollution effects (except perhaps for neuston) under such circumstances.

Monitoring the wider effects on pelagic eggs and larvae by the present year's CalCOFI survey will continue. Jordan will be sent through the area again in the course of routine survey. We are confident that if the Santa Barbara leakage continues, and if it produces a significant effect upon spawning and viability of pelagic species, this effect will be detected in the present year's sampling program.

Chemical Dispersant Used

A chemical dispersant, said to be nontoxic to marine life (COREXIT 7664) was used widely in the area around the leaking oil well but only slightly in the near-shore area. A sample was obtained from the manufacturers. Its toxicity was tested in a preliminary manner by Dr. Lasker.

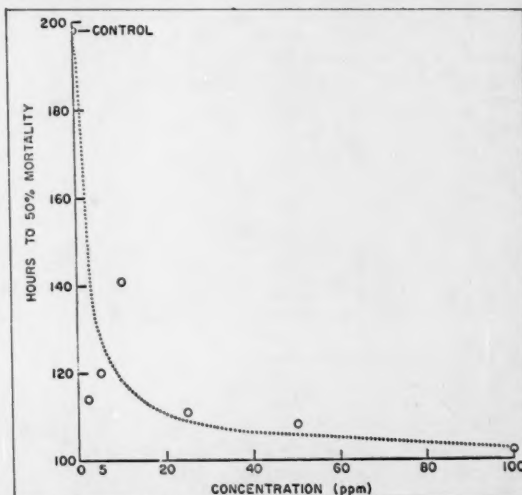


Fig. 2 - The effect of the dispersant COREXIT on *Engraulis mordax* (northern anchovy) eggs & larvae.

Samples, each of 50 late-development anchovy eggs, used for bioassay indicates toxicity, as measured by time to 50% mortality, at all levels of dilution in natural sea water which were tested. Concentrations of only 2 ppm. COREXIT 7664 reduced the 50% mortality time of eggs and larvae to 57% of the control, while the higher concentrations were only slightly more detrimental (see Fig. 2).

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California Vessel Longlines Broadbill Swordfish

M/V 'Blue Belle' returned to San Diego, Calif., on Feb. 8, 1969, with the first load of longline-caught broadbill swordfish by a California commercial vessel. She fished a total of 4,200 hooks and caught 33 swordfish (average 0.8 fish per 100 hooks). Total dressed weight of the landed fish was about 2.5 tons. Each of 10 sets produced at least 1 swordfish; the two best catches were 9 fish on 392 hooks and 8 fish on 336 hooks. The swordfish ranged in fork length from 91 to 277 cm. (20 to 360 lbs., dressed). Gonads collected from 29 fish showed that 27 were females, none in advanced stage of development.

The catch also included several dolphinfish, one striped marlin, and about 1,500 sharks, most were blue sharks. In addition, 2 tons of yellowfin and skipjack tuna were taken on trolling gear.

The vessel worked near Uncle Sam Bank (Lat. 25° 35' N.; Long. 113° 30' W.). The water temperature ranged from 19.2 to 21.4° C. BT casts taken before each set revealed sharp thermoclines starting at 43 to 72 m.

The longline gear and methods worked satisfactorily. Four men were able to conduct the operations efficiently. Because of many sharks encountered, however, the crew found it difficult to set more than 400 hooks. The sharks caused extensive snarling of the mainline and often cut it. Much time was spent replacing cut leaders and unsnarling the line.

Second Trip Scheduled

The results of the trip were sufficiently promising to warrant a second trip. Blue Belle was planning to fish again in March. A second vessel, 'Ron H.' out of Morro Bay, will also enter the fishery. Both will use BCF-designed gear and methods. The experience gained will increase knowledge of distribution and life history of the swordfish and lead to establishment of a profitable fishery.



Juvenile Tropical Fish Raised in Lab

For the first time, eggs and larvae of important tropical fishes from the western Atlantic Ocean have been raised to juvenile size in the laboratory, reports the University of Miami's Institute of Marine Sciences.

Charles A. Mayo, a graduate student, succeeded in rearing 13 species of fishes, representing 12 fish families, from egg to juvenile. The fishes are herring, anchovy, sea trout, flounder, flyingfish, pigfish, grunt, sea robin, pinfish, spadefish, goby, dragonet, and trunkfish. All form important links in the sea's ecologic balance.

Dr. F. G. Walton Smith, Institute Director, stated: "This well-established success in rearing many species of young tropical Atlantic fishes is unprecedented. Furthermore, the techniques developed and proved successful by the Institute can be used for rearing species most often sought by commercial and game fishermen, including tuna, sailfish, marlin, dolphin, and king mackerel, and this is one of the goals of our study."

Mayo's Work

Mayo collects eggs for his fish nursery by towing a plankton net far out in the Gulf Stream, and from the Institute's dock in Bear Cut. Once the eggs have hatched in laboratory tanks, the larval fishes feed on zooplankton. To provide an abundant supply of food, Mayo has created an 'in-the-laboratory food chain.' Zooplankton feed the fish larvae, and the zooplankton is fed phytoplankton maintained on organic and inorganic nutrients added to the tanks.

The development of eggs and larval fishes is watched closely by Mayo. He records observations, takes photos, and preserves individual specimens. Many fishes are difficult to identify until long after they have hatched, states the Institute. Data from this study provide information on the "functional structure, behavior, and growth of fishes in their early stages of development."



Young Indians Tour BCF's Miami Lab

Forty young American Indians traveled from their ancestral camp in the Florida Everglades to the scientific environment of a modern marine research laboratory on March 14. They visited BCF's Tropical Atlantic Biological Laboratory (TABL). All were students at the new Miccosukee Day School on the Tamiami Trail at Forty Mile Bend, Florida. The Miccosukee people were settled in Florida long before the white man came. They are not related to the better known Seminole Tribe.

A Full Day

The 10- to 17-year old students were accompanied by an interpreter (they speak little English) and by Robert Pinard, Director of Student Activities. They saw a film on marine life and the ecology of the oceans. They toured the lab and later visited the Miami Seaquarium as guests of the management.

Later, they toured the TABL research vessel 'Undaunted' and TABL staff explained some procedures followed on marine scientific cruises.

Marine Science Job Opportunities

The theme emphasized throughout the visit was that marine science could lead to rewarding careers for nature-oriented American Indian youths. They were told about the many jobs in the expanding field for trainees, ships' crew members, technicians, and scientists, particularly in Florida. Laboratory and school officials hoped to encourage in the young Miccosukee "an awareness of the natural affinity between their innate understanding of the wilderness and the doctrines of the marine scientist, and perhaps to stimulate an ambition to study subjects that will equip them for careers in marine science."



IF ALL THE ICE IN THE WORLD SHOULD MELT, WHAT WOULD HAPPEN?

The possibility that all the ice in the world would melt is extremely remote. If it should happen, the time span would be measured in thousands of years and the increased weight of the water would probably cause the ocean basins to sink and the land masses to rise.

In the unlikely event that all the world's ice would suddenly melt, the sea level all over the world could rise as much as 500 to 600 feet. The Antarctic ice cap alone covers 6 million square miles and, if melted, would yield about 6.5 million cubic miles of water, enough to feed the Mississippi for more than 50,000 years.

A rise of even 100 feet would flood most of the Atlantic seaboard of the United States, including all the major cities. A rise of 600 feet would cause the seas to cover 85 or 90 percent of the earth's surface (the oceans now cover about 71 percent of the earth's surface). The United States would be split in two by the "Mississippi Sea" which would join the Gulf of Mexico with the Great Lakes.

On the basis of evidence gathered from all over the world, Dr. Rhodes Fairbridge of Columbia University concludes that some 6,000 years ago the oceans rose about 14 meters within a few centuries, flooding almost all the areas where man had begun to found civilizations. He believes this to be the same Great Flood described in the Bible, in Buddhist records, and in legends handed down in many lands.

There is also the possibility that the ice age is not yet over and that the ice caps may again increase in size. If another glacial advance comparable to the last one should occur, many of the important manufacturing and agricultural areas of the world would be covered, forcing widespread migrations. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

Fishery Legislation Proposed in Congress

The bills introduced recently into both Houses of the 91st Congress show that members are concerned about quality and the need for sanitation controls over fish and fish products.

On Feb. 19, Sen. Hart, Mich., introduced S. 1092. This bill proposes inspection of fish and fishery products, inspection of facilities used in their harvesting and processing, and cooperation with States in regulating intrastate commerce.

The bill would authorize the Secretary of Health, Education, and Welfare to survey the fishing industry and, within 1 year after the act's effective date, issue minimum standards of sanitation and quality control in processing. These standards, effective 1 year after issuance, would apply to fish-processing establishments, fishing vessels, transportation, and storage. Sen. Hart noted that all fish products would have to bear an official mark or inspection legend before they could be sold at retail; also, no edible fish or fishery product could be imported into the U.S. unless processed in a country whose inspection program was 'at least equal' to that of the U.S.

At the same time, Sen. Hart introduced S. 1091. This bill would give the Department of the Interior specific authority to provide technical assistance--and to make loans to the commercial fishing industry in order to meet the requirements of the new legislation. The fisheries loan fund would be increased by \$15 million for that purpose.

In the House, Rep. Rodino, N.J., introduced H.R. 7905 and H.R. 7907, covering the same ground as S. 1091 and 1092.

Disease Control

On Feb. 25, Sen. Moss, Utah, introduced S. 1151, a bill to protect the fish resources of the U.S., including freshwater and marine fish-culture industries, from the introduction and dissemination of fish and shellfish diseases.

Sen. Moss noted that the bill authorizes Federal fishery workers, whenever a serious outbreak warrants, to seize, quarantine, or dispose of any fish posing a disease threat to U.S. fisheries. This would include both imported fish and fish transported in interstate commerce.

The proposal calls for development of State-Federal cooperative programs to control fish disease. It prohibits interstate transportation of diseased fish or shellfish by common carrier or by personal means.

The bill spells out penalties for violation of fish disease-control laws. It provides protection for employes carrying out their assigned duties. It authorizes the Secretary of the Interior to compensate growers for losses due to fish disease-control programs.

Sen. Moss also referred to 3 resolutions on fish disease control: One, passed at the U.S. Trout Farmers Association convention in Oct. 1968, asks Federal assistance in controlling whirling disease of trout and other salmonids. The other resolutions, passed at the American Fisheries Society meeting in Sept. 1965, asked for establishment of a national reporting service on fish diseases, and for help in preventing importation of viral hemorrhagic septicemia.

Fishing Fleet Replacement & Expansion

Sen. Stevens, Alaska, introduced S. 936, to promote the replacement and expansion of the U.S. nonsubsidized merchant and fishing fleets.

Harassment of U.S. Fishing Vessels

Rep. Van Derlin, Calif., introduced H.R. 5277, a bill to instruct the President to impose a ban on fishery imports from countries interfering with our fishermen outside the 12-mile limit. He said the bill would be more widely applicable than the cutoff provisions of the Fishermen's Protective Act because it would cover all cases of illegal harassment--regardless of whether the fishermen involved had suffered actual financial loss.

--Barbara Lundy



OCEANOGRAPHY

Grand Banks 1969 International Ice Patrol

The U.S. Coast Guard Oceanographic Unit will conduct the oceanographic support program for the 1969 International Ice Patrol during April 1-June 30, 1969. Two oceanographic cruises to the Grand Banks region are scheduled aboard the 'Chincoteague' and 'Cook Inlet'.

The main purpose will be to conduct oceanographic surveys of the Grand Banks region to furnish real time marine environmental analysis to the Commander, International Ice Patrol. The secondary purpose will be to study the structure and migration of the semi-permanent eddy at the Tail-of-the-Banks, and to delineate the cold core of the Labrador Current.

The Operation

The temperature and salinity data will be collected by Nansen casts and/or a Salinity-Temperature-Depth Sensor System from the surface to 1500M at each station along the section survey. Temperature data will also be obtained by bathythermograph. All data will be processed at sea by digital computer and transmitted to Commander, International Ice Patrol in New York for operational use.

Data will be available at the National Oceanographic Data Center about 2 months following these cruises. These data, with analysis, will be published in the U.S. Coast Guard Oceanographic Report Series (CG-373).



Gulf of Mexico Knolls Are Salt Domes, Oil Core Analysis Indicates

The Sigsbee Knolls, extensive mounds on the floor of the Gulf of Mexico under 12,000 feet of water, have been demonstrated 'almost conclusively' to be salt domes. The find was made following laboratory analysis of oil- and gas-bearing cores taken in 1968 during an early phase of the Deep Sea Drilling Project (DSDP). The work was conducted by Scripps

Institution of Oceanography under contract to the National Science Foundation.

A series of tests was made in several laboratories expert in analysis of cores containing oil, gas, and other minerals commonly found with salt domes. Scripps reported the tests demonstrated that "the oil is relatively young, that the rock is mainly calcite and sulphur, and that the rock contains an accumulation of palynomorphs (fossil pollen, primarily) of Jurassic age (about 160 million years old)."

The Knolls

All these characteristics are found in salt domes productive of oil and gas on or near shore in the Gulf of Mexico. The test results and earlier geophysical profiling support the long-held belief that the knolls are sea-floor mounds produced over upward-thrusting salt formations.

The Knolls were discovered in 1954 as topographical features by Dr. Maurice Ewing of Columbia University's Lamont-Doherty Geological Observatory. He predicted they were salt domes and urged that drilling into one dome be given high priority on the Deep Sea Drilling Project.

In 1960, more evidence that the Knolls were salt domes was obtained by Dr. J. Lamar Worzel and John Ewing, when continuous seismic reflection profiling showed there were many buried domes in the vicinity.

'Glomar Challenger' Proves Case

At first, there was strong doubt that these structures were salt domes. It was based on the difficult problem of explaining how a great bed of salt could have been deposited on the floor of a basin as deep and as large as the Gulf of Mexico. The doubt persisted until the Glomar Challenger drilled into a dome on the first leg of DSDP.



Investigate Unseen 1,000-Mile-Long Planetary Waves in Pacific

An extensive investigation is being made in the Pacific for unseen and elusive ocean waves thought to be about 1,000 miles long and which take 2-4 weeks to complete one cycle. This is reported by the Commerce Department's Environmental Science Services Administration (ESSA).

The waves will be recorded by 15 tide gages on islands of the Caroline and Marshall groups--on an east-west line stretching 2,500 miles across the Pacific, about 500 miles north of the Equator.

Known as planetary waves, they are believed caused by the gravitational attraction of the sun and moon on the earth, and are therefore special tides. Once initiated, however, the waves apparently are very largely

governed by water depth and by the effect of the earth's rotation on its axis.

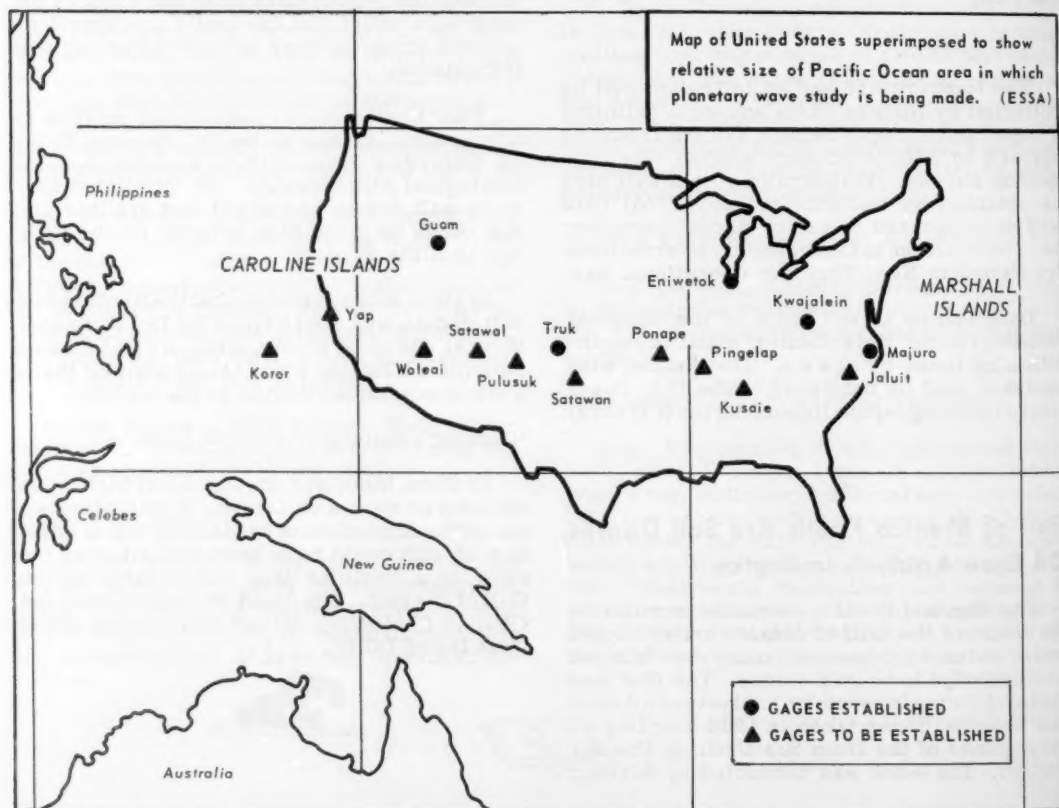
ESSA-MIT Study

The investigation is being undertaken by scientists of ESSA and the Massachusetts Institute of Technology. Data about the planetary waves will be gathered by the gages for 4 years. Then the data will be subjected to analysis by high-speed electronic computers at ESSA and MIT.

The investigation is being conducted by 3 physical oceanographers: Prof. Henry M. Stommel and Prof. Carl I. Wunsch of MIT, and Steacy Hicks, head of oceanographic research for ESSA's Coast and Geodetic Survey.

Planetary Waves

Hicks said that existence of planetary waves was established only in the present



Planetary wave observation sites.

decade primarily through work by Wunsch. Because of the waves' length and the time required to complete a cycle from beginning to end, the waves are not easily detected.

The investigators hope to answer: Do the waves move across the ocean, or do they merely oscillate back and forth in a specific area, like water sloshing in a bathtub? How high are they? What is their significance?

The researchers will look for similarities with the well-known planetary waves of the atmosphere, discovered years ago by the late Carl-Gustaf Rossby, a noted MIT meteorologist.

Hicks said: "Planetary waves of the atmosphere serve an important function in governing changes in weather. Does it follow that those of the ocean serve a similar function? In other words, what effect do planetary waves have on changes in the ocean environment? These are some of the things we will also be looking for when we study the data recorded by our gages."

Pacific Good Study Area

Planetary waves are believed to exist in all oceans, but the Pacific is regarded as particularly well-suited for the study. Numerous islands dot the area and permit correct spacing for locating the waves. Also, weather fluctuations, which would tend to complicate the records, are relatively small in this region near the Equator. However, many other waves found will have to be filtered out by a mathematical process before data can be studied.



Scripps' 'Argo' Sails To Study Drilling Sites

Only about a month after ending a 57,200-mile, globe-girdling, cruise on Jan. 30, 1969, Scripps Institution of Oceanography's Argo sailed from San Diego on March 4 on a 11½-month, 38,340-mile expedition in the Pacific. Argo will traverse north and south Pacific Ocean in counterclockwise direction.

During Expedition SCAN, scientists and technicians will study and select 36 sea-floor sites to provide the best geological conditions for the drilling ship, 'Glomar Challenger,' as

she conducts Pacific Ocean phase of Deep Sea Drilling Project (DSDP).

SCAN's Main Purpose

Prime purpose of SCAN, supported by National Science Foundation and Office of Naval Research, is to investigate types of sediments and geological formations which Challenger will drill.



New Evidence Reported of S. Atlantic Sea-Floor Spreading

Two scientists of the Woods Hole (Mass.) Oceanographic Institution have revealed new evidence of sea-floor spreading in the South Atlantic. Their findings suggest that Africa and South America were joined about 150 million years ago.

The sea-floor spreading has measured about 1 inch per year for the last 70 million years. It appears symmetrical about the axis of the Mid-Atlantic Ridge, which bisects the ocean floor between Africa and South America. The mechanism causing the spreading is not known.

These are the tentative conclusions of the Co-Chief Scientists of Leg III, Deep Sea Drilling Project, Drs. Arthur E. Maxwell, Associate Director of the Woods Hole Oceanographic Institution, and Richard P. Von Herzen, Associate Scientist. They were members of a 15-man team aboard the drilling ship 'Glomar Challenger' from Dakar to Rio de Janeiro, Dec. 1, 1968, to Jan. 24, 1969.

The Operation

Scientific teams of the Deep Sea Drilling Project are drilling and conducting preliminary core descriptions following plans of the Joint Oceanographic Institutions for Deep Earth Sampling.

Maxwell and Von Herzen said 10 holes had been drilled. More than 90% of the attempted corings resulted in recovered cores. Dr. Maxwell added: "This is a highly successful rate, even on land, let alone at sea, where the conditions are much more difficult."

The drilling took place on the flanks of the Mid-Atlantic Ridge, where the structure and

movement of the earth's crust were studied. Sedimentation revealed the age of the ocean floor at varying distances.

"The ages of the sediments, and their respective distances from the Mid-Atlantic Ridge, indicate that two points at equal distances on each side of the Ridge axis at 30 degrees south latitude have been spreading apart at the rate of two inches per year for the past 70 million years."



New Bathymetric Chart of Washington Coast Now Available

A new Bathymetric Chart of the coast of Washington covers an area from southern British Columbia to south of the Columbia River. It shows the seafloor from the coastline to approximately ninety miles west. It covers the continental shelf slope and as it descends into deep water.

The Chart is 5 feet long, 32 inches wide, and uses a cartographic technique that combines subtle shadings of color with contour lines to give a 3-dimensional portrayal of the ocean's floor.

The 2 U. of Washington oceanographers who created it--Dr. Dean McManus and Noel McGary--began working on the concept about 2 years ago with ESSA and the U.S. Geological Survey. They were aided by State of Washington agencies.

Navigation by Sounding

The Chart can be used for navigation by sounding. Coordinates can be transferred to standard charts for pinpoint surface navigation. Because of the accuracy used in assembling the 3-D portrayal of the ocean floor, the new map makes an excellent educational tool, the Oceanographic Commission of Washington states.

The Oceanographic Institute of Washington--200 Second Avenue North, Seattle, Wash. 98109--is selling the new chart for \$3.50, plus 25¢ to cover mailing.



International Guide for Maritime Distress Being Prepared

An International Guide for Maritime Distress is being prepared by a committee of the Intergovernmental Maritime Consultative Organization (IMCO), reports the U.S. Coast Guard.

The guide is intended to provide instructions to merchant vessels in distress, and to those in position to assist other vessels. If accepted by IMCO, all commercial vessels flying the flags of IMCO's 67 member nations may be required to carry and comply with the guide.

New Guide's Information

At present, there are no internationally accepted standards for search and rescue--except those set up by the International Civil Aviation Organization (ICAO) to rescue downed fliers. The Coast Guard says: "The new guide will provide similar coverage for shipping. It will include instructions on emergency communications, rescue and care of survivors, and plans and coordination of large-scale searches. It will explain what actions might be expected of a distressed vessel, and how an assisting vessel can be most effective."



Foreign Fishing Off U.S. in January 1969

NORTHWEST ATLANTIC

Continuous bad weather, especially in the Mid-Atlantic Bight, restricted aerial surveillance during Jan. 1969. Nevertheless, 39 individual¹ fishing and support vessels from the Soviet Union, and 2 from Japan, were observed. It was estimated that 25 to 30 more Soviet vessels were in the area, but these were not sighted.

Off Southern New England

Soviet: Early in the month, 8 to 10 factory stern trawlers were scattered 30 to 35 miles south of Martha's Vineyard and Nantucket. From mid-month, 10 to 15 stern trawlers were in a 20-mile area, 65 to 70 miles south of Block Island, just beyond the eastern boundary of the 'no fishing' zone in ICNAF Sub-area 5. Moderate-to-heavy catches of red hake and some whiting were observed on deck and, usually, dehydration plants were operating. A few vessels fished red hake and whiting south of Nantucket.



Fig. 1 - Soviet factory stern trawler 'Sputnik' fishing for red hake south of Block Island, R.I., during January 1969.



Fig. 2 - Aerial view showing substantial catch of red hake on board Soviet factory stern trawler observed during January 1969 while fishing 65 to 70 miles south of Block Island, R.I.

(Photos: Resource Management, BCF)

Off Mid-Atlantic

Soviet: Fishing activity increased early in Jan. when about 25 medium side trawlers and support vessels began fishing 25 to 30 miles off New Jersey. By month's end, the fleet had increased to an estimated 50 vessels dispersed over an 80-mile area, 20 to 25 miles offshore from east-southeast of Sandy Hook to east of Cape May. Catch was reported to be herring and some mackerel. On Jan. 29, U.S. fishermen sighted 25 to 30 side trawlers fishing herring and mackerel about 60 miles east of Cape Henry, Va.

On Feb. 4, one Japanese, 3 Polish, and 53 Soviet vessels were sighted off the New Jersey Coast.

Japanese: On Jan. 8 and 23, the stern trawler 'Sekishu Maru' was observed fishing 65 to 70 miles southeast of Cape May, in the U.S.-USSR 'no fishing' area. On Jan. 17, the stern trawler 'Shirane Maru' was sighted 70 miles south of Martha's Vineyard off Massachusetts. No catches were noted on either vessel.

U.S.-USSR Mid-Atlantic Fisheries Agreement

No violations were observed in Jan. 1969. During the first half of the month, Soviet trawlers and transports used the designated loading zones off Long Island and New Jersey. As many as 8 vessels at a time were reported in the zones.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels were reported in Jan. 1969.

OFF CALIFORNIA

No foreign fishing vessels were sighted in Jan. 1969; 15 Soviet fishing and support vessels were sighted in Jan. 1968.

OFF PACIFIC NORTHWEST

One Japanese longliner was sighted off Washington late in the month; catch was not identified. No Soviet fishing vessels were observed.

OFF ALASKA

Soviet: Over 130 fishery vessels had been sighted by the end of Jan. 1969--about 40 more

than in Dec. 1968, and 20 more than in Jan. 1968. Most fished herring and flounder in the central and eastern Bering Sea, respectively.

One medium trawler fished Pacific perch in the Gulf of Alaska, along the 100-fathom curve south of Kodiak Is. Perch fishing in other areas off Alaska had ceased by early January.

The herring fleet north of the Pribilofs grew from about 48 vessels in late Dec. 1968 to about 70 by end of Jan. 1969. Trawlers had good catches during the month. ABCF-Coast Guard fisheries patrol observed the herring fleet in mid-month. Stern and side trawlers' average drags lasted 1 hour. Catches ranged from 1 to 15 metric tons and averaged 6-7 tons per haul. Many trawlers appeared to be using midwater gear--the first known use of such gear in this fishery.

Eastern Bering Sea flounder fishery vessels increased from about 40 to 50 during the month.

The Soviets abandoned the groundfish trawl fishery in the central Bering Sea during early Jan. The 5 medium trawlers operating there presumably moved to the herring fishery. At least 1 reefer and 12-15 medium trawlers fished north of the Fox Is. throughout the month.

Japanese: About 40 vessels were reported in Jan., comparable to the number in Dec. 1968, but about 5 less than a year ago.

Six stern trawlers were in the Gulf of Alaska ocean perch fishery--4 fished primarily off southeast Alaska and 2 principally in the central Gulf. The 12-13 stern trawlers fishing perch in the central Bering Sea shifted to herring fishing south of St. Matthew Is. in early Jan.

Two factoryships and 14 trawlers, producing fish meal and oil and minced fish meat, operated in the eastern Bering Sea. During first 3 weeks in January, 1 factoryship and 8 trawlers fished the Continental Shelf edge, north of Fox Is. to south of St. George Is., primarily catching Alaska pollock. The factoryship returned to Japan in late Jan. The other factoryship and 6 trawlers remained on the traditional flounder grounds north of Unimak Is.

During second week of Jan., a Coast Guard Fisheries patrol, with a BCF agent aboard, observed about 12 Japanese stern trawlers and 2 side trawlers fishing herring at about 65 fathoms, northwest of the Pribilofs in the central Bering Sea. The Soviet herring fleet also fished in this area.

Four Japanese longliners fishing sablefish in the Gulf of Alaska concentrated around Cape Ommaney. Two, however, ranged as far north as the Yakutat grounds during mid-Jan. before returning to the southeast Alaska area.

South Korean: No fishing vessels have been reported since early January. Presumably the 1 stern trawler previously reported off Alaska has left.



STATES

Alaska

STATE BIOLOGISTS MAKE 1969 SALMON FORECASTS

Biologists of Alaska's Fish and Game Department have the following 1969 salmon outlook for these areas:

Bristol Bay: A preliminary forecast is for a red-salmon run of more than 18 million fish. This excludes the Japanese high-seas harvest. The run will be a decided improvement over the disaster years of 1967 and 1968. Last season, the run was about 8.5 million fish; of these, 5.5 were allowed for spawning, and 3 million were harvested. The probable red-salmon harvest in 1969 is estimated at 9 million fish.

Kodiak: The highlight will be the return of the odd-year pink-salmon cycle from the disastrous low of 1967.

Cook Inlet: In summer 1969, pink and chum salmon are expected to be in short supply in the major part of the Inlet. These species provided most of the district's canned pack in the 1968 season. The northern part of the area is expected to be most affected by the reduced run.

No forecasts were made on the Cook Inlet red-salmon runs. However, it is generally believed 1969 returns will be a little less than normal.

Prince William Sound: The area hit hardest by the 1964 earthquake is recovering. Some of the tighter restrictions imposed then are being eased.

Pink salmon runs in permitted areas will total an estimated 5.8 million, over twice the 1968 runs.

Southeast Alaska: It faces a poor salmon season and the State has issued restrictive regulations.

Pink salmon usually are the bulk of the Southeastern salmon packs. In 1968, the run was nearly 30 million, the largest in 17 years. It produced a pack of 972,000 cases.

The 1969 forecast is for only about 8 million pinks, of which 5 million will be needed for seed stocks. The low forecast is based on the poor parent year 1967 and on spawning-stream studies.

RALSTON PURINA TRIPLES PROCESSING CAPACITY AT KODIAK

Ralston Purina has installed 3 more new-type shrimp-peeling machines at its Royal Reefer plant in Kodiak. The plant now will operate two 10-hour shrimp shifts and its production capacity will be increased 300%. It will be able to handle a total of 64,000 pounds of shrimp a day.

The firm also has arranged to add 3 more large vessels to the shrimp fleet: the 'Peggy Jo,' 'Robbie,' and the 'Alaskan'.

The firm has moved steadily towards shrimp production to supplement king-crab processing.



California

TO RECOMMEND RISE IN SHRIMP CATCH QUOTA

The California Department of Fish and Game will recommend to the Fish and Game Commission a 50-percent increase in the commercial shrimp quota for Area A off the Humboldt-Del Norte County coast in 1969--to 3 million pounds, a million over 1968.

The recommendation followed a meeting of marine biologists with industry representatives in Crescent City on Feb. 11, 1969, to review the Department's management proposals for shrimp in Area A. The Department's marine biologists said the 1968 fall population survey indicates a population of 8.8 million pounds of shrimp on Area A beds.

Population Model Built

By constructing a population model with the aid of a computer, the biologists concluded

that a population of 7.1 million pounds will allow a harvest of 1.7 million pounds on a sustained basis. The surplus above 7.1 million pounds may be harvested safely without endangering basic breeding stocks. That would provide a basic sustained or equilibrium harvest of 1.7 million pounds, plus 1.7 million pounds of surplus shrimp, for the 1969 season. The 400,000 pounds more than the proposed quota of 3 million pounds are allowed arbitrarily for harvest by Oregon vessels. These take some shrimp off the northern portion of Area A beds.

Survey Cruise

A tentative state-industry agreement calls for a joint "in-season" population survey cruise during the 1969 season. The cost of the expensive surveys would be shared. Also, the cruise will enable the Department to draw on the talent, knowledge, and specialized fishing gear of the commercial industry. A joint survey was made during the 1968 season. It resulted in the recommendation that the quota be raised from 1.5 million to 2 million pounds. Industry also cooperated with the Department in a 1964 survey cruise.

California-Oregon Cooperation

The Department also plans to work more closely with Oregon fishery officials than in the past--on seasons and other regulations affecting the ocean resources of the 2 states.

The season for Area A--the Pacific Ocean between a line extending due west of False Cape, near Cape Mendocino, and the Oregon border--usually is May 1 through October 31, or until the quota is reached.



Washington

SHELLFISH CATCH RISES 12%

From January through October 1968, the shellfish catch in Washington State totaled 15.4 million pounds. This was an increase of 1.6 million pounds, or 12%, over the 1967 period.

Landings of Dungeness crabs reached 8.8 million pounds, up 31%. The shrimp catch of 1.2 million pounds was an increase of 9%. The production of Pacific oysters from Washing-

ton Coast was 2.8 million pounds, a rise of 12%.

There were decreases in production of hardshell and razor clams, Olympia oysters, and Puget Sound Pacific oysters.

CHINOOK SALMON FLOWN TO NEW YORK

In December 1968, the University of Washington airlifted 100,000 selected chinook salmon eggs to the New York State Department of Conservation for spring 1969 planting in Lake Ontario. New York ordered the eggs after watching the results of plantings in Lake Michigan and Lake Superior by Michigan and Wisconsin.

New York will hold the eggs until they hatch this spring and put them in streams that feed Lake Ontario. Conservation Department officials hope the fingerlings will stay put in Lake Ontario--as their cousins did in Michigan and Superior. In the latter two, the original coho, and later chinooks, thrived on a rich food supply and the absence of natural predators. Both breeds revitalized sport fishing and business in neighboring communities.

College of Fisheries Active

The University of Washington breeds salmon selectively each year and produces more than 5 million salmon eggs. Its College of Fisheries uses a half-million for research and development projects. The remainder are available, under strict supervision, to stock non-Washington waters.

In addition to the New York shipment, eggs were sent to Michigan, Wisconsin, Japan, and the Quinault Indian Reservation in Washington State.



Virginia

EDA EXTENDS OYSTER STUDY

The Commerce Department's Economic Development Administration (EDA) has approved technical assistance funds of \$45,254 to help continue the feasibility study of establishing oyster hatcheries in the lower

Chesapeake Bay area of Virginia. The funds will be supplemented by \$15,200 from the applicant--the Windmill Point Oyster Co. of Irvington, Va.

The study, begun mid-1966 to revive declining oyster production in the James River area, will be extended one year. The study has developed data on oyster spawning and setting of larvae.

1969 Program

Research this year will develop and evaluate the use of cultch-free oyster seed produced in hatcheries. It will seek to determine costs, resistance to disease, predation of young oysters--and effects on their growth of water depth, tidal currents, salinity, storms, and seasons.

The cultch-free oysters are cultivated in baskets or trays off the bay bottom. This method was developed by Windmill researchers to save the many man hours needed to operate the equipment used to handle the heavy cultch.



Maine

SARDINES PROMOTED

The Maine Sardine Council has requested BCF assistance in a nationwide educational program to encourage sardine consumption because of heavy production, large inventories, and a declining share of the market for Maine sardines.

In 1968, production was 1.6 million pounds; in 1967, 1.2 million pounds. On Jan. 1, 1969, inventories for domestic canners were 765,000 cases; on Jan. 1, 1968, 340,000 cases. Since 1957, U.S. market share has decreased from 65% to 35%.

The program is aimed at extension agents, school lunch administrators, institutional managers, professional food groups, retailers and others in the food trades through the use of newspapers, radio & television, and personal contacts.

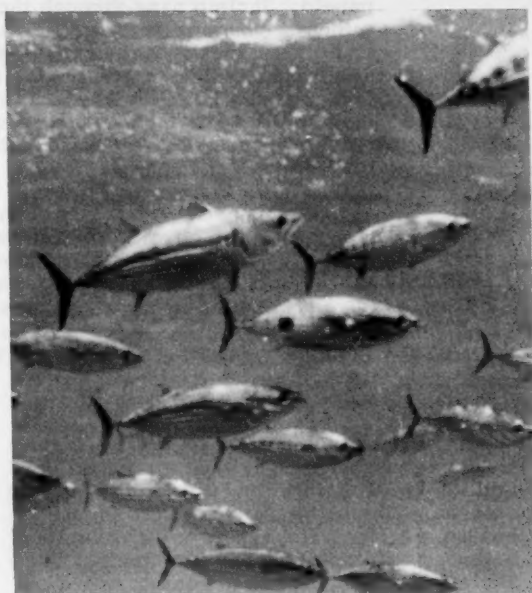


Commonwealth of Puerto Rico

TUNA INDUSTRY GROWS

Puerto Rico's tuna industry continues to grow, reports the island's Department of Agriculture. During 1968, over 126,000 tons of tuna were unloaded and processed, 6,000 tons more than in 1967.

The established tuna cannery in Ponce, on the southern coast, will be expanded by the construction of more freezers, a warehouse, and packing lines. Another cannery will be built. In Mayaguez, on the west coast, the 3 plants have increased their facilities and plan further expansion.



Tuna seen from observation chamber of research vessel.

A Tuna Canning Center

Tuna canning is the most important food-processing industry. It employs 2,200 people. In 1968, production was over 6.3 million cases, excluding pet food, and was worth more than \$80 million. "If the upward trend continues," the Department of Agriculture says, "the Island will soon be the tuna canning center of the world."



ARTICLE

A PROGRESS REPORT ON THE DEVELOPMENT OF A SHRIMP TRAWL TO SEPARATE SHRIMP FROM FISH AND BOTTOM-DWELLING ANIMALS

William L. High, Ian E. Ellis, and Larry D. Lusz

BCF has developed a trawl that separates, while fishing, shrimp from other marine animals. The design resulted from experiments aboard the 'John N. Cobb' and several cooperating Pacific Northwest commercial shrimp trawlers. Behavioral studies of the response of shrimp and associated marine animals to capturing gear contributed to the gear development.

The BCF shrimp-sorting trawl has long wings with double web panels. Shrimp pass through the large mesh inner panel and are retained by the small mesh outer panel, which leads to a cod end. Fish and other "trash" that cannot pass through the inner web lead aft, either passively or actively, to a trash chute that allows passage back to the seabed. The shrimp-sorting trawl caught up to 2,000 pounds of shrimp per tow. This catch usually contained less than 1 percent trash, whereas conventional nets fished nearby had catches up to 80 percent trash.

Shrimp catch rates have been less when using the shrimp-sorting trawl than for conventional trawls. This problem is being studied. Time-consuming sorting, however, is nearly eliminated, and shrimp quality improved. The sorting trawl permits fishing during late evening and morning hours of darkness, and on grounds not now fished because of high trash catches. Research is continuing to further improve catch rates and separation, and to modify the trawl for other shrimp fisheries.

One major concern of commercial shrimp fishermen is the large amount of fish and bottom-dwelling invertebrates in the shrimp catches. Along the Washington and Oregon coasts, shrimp fishermen are particularly bothered with small flounders, Pacific hake, sablefish, smelt, and sea urchins.

In the Pacific Northwest, shrimp fishermen spill their pink shrimp catch from the trawl onto a large sorting table, where crew members handpick out all "trash" (unwanted fish and invertebrates caught incidentally). Because shrimp must be free of all trash and mud to be marketable, extra manpower is required to assist with this time-consuming task. If the sorting problem could be eliminated, only 3 men would be required in the

crew instead of the present 4. Sorting time varies with the amount and kind of trash. A typical catch aboard a Pacific Northwest shrimp trawler might contain 1,500 pounds of pink shrimp and 5,000 pounds of trash, which would require about 3 man-hours to separate.

Some fish caught in shrimp trawls have market value but usually cannot be handled profitably along with shrimp. Moreover, some state laws prohibit large amounts of fish to be landed by shrimp trawlers.

Present trawl capture techniques damage both shrimp and fish. Shrimp are crushed by large volumes of fish, and fish are repeatedly punctured by shrimp rostrums. Broken sea

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U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
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urchins stain shrimp and are very difficult to sort from shrimp. Small-mesh shrimp trawls also capture large numbers of young fish; most of those that have air bladders, such as hake and rockfishes, do not survive when returned to the sea bed. Consequently, many fish die even when discarded.

Trash in shrimp catches reduces fishing efficiency. Vessels are often forced to cease fishing temporarily when the entire catch cannot be brought aboard at once. Part of the catch must remain in the trawl alongside the vessel until space is available on the sorting table. When the amount of trash is too great to make sorting feasible, the entire catch is dumped overboard and new grounds having less trash are sought. Shrimp trawling is not conducted during early morning and late evening because the catch is mainly trash, especially small flounders.

In May 1968, BCF's Exploratory Fishing and Gear Research Base at Seattle, Wash., began experiments and fishing trials to develop a method of reducing unwanted marine forms in shrimp catches. Experimental approaches presented in this report are based on a detailed understanding of trawl design tied closely to investigations of the behavior of shrimp and other animals.

BACKGROUND

Early Separator Shrimp Trawl Research in Europe

In 1963, French researchers experimented with a shrimp trawl designed to separate shrimp from flatfish (Boddeke, 1965). The trawl was designed on the principle that shrimp and flatfish respond differently to a stimulus--shrimp swim up into the water column whereas flatfish swim toward the ocean bottom. A conventional shrimp trawl was divided into upper and lower sections by a large-mesh curtain or panel of web. The upper section was completely closed off from the lower section. The separator panel was weighted so that it hung horizontally throughout the length of the trawl body and terminated at a junction of upper and lower cod ends. In theory, shrimp would swim up through the large-mesh separator panel and lead back into the upper cod end, while flatfish and other bottom-dwelling invertebrates would not swim through the panel and would pass out through the lower cod end, which is not tied.

The Dutch began experiments with the French sorting trawl in 1964 to determine its utility for the Dutch shrimp fishery. In their tests, the French sorting trawl had a lower catch rate than the control trawl, a traditional Dutch trawl. Consequently, a funnel-like separator was incorporated. This net had higher catch rates than the French-designed trawl and the control trawl.

Pertinent BCF Observations on Animal Behavior

Observations on the behavior or inferred behavior of shrimp to shrimp trawls was limited to data accrued during exploratory surveys and incidental "in situ" observations.

- Distribution of shrimp in trawls and inferred behavior.

When being fished, both 400-mesh Eastern otter trawls and 57-foot semiballoon trawls have large areas of closed meshes due to unequal distribution of strain on the web. Trawls have often been retrieved with hundreds of shrimp trapped in the forward top and wing meshes. Shrimp encountering the closed meshes passed through or were forced into the webbing, where they became lodged.

BCF scientists aboard the minisub *Pisces* observed pink shrimp during dives in Puget Sound, Washington. Individual shrimp were seen both on the bottom and occasionally well up into the water column. Shrimp generally moved slowly across the bottom unless disturbed by near contact with the *Pisces* skids. On these occasions, the shrimp usually jumped 1 to 2 feet sideways or upward away from the skid. Unless disturbed again, the shrimp usually made no further rapid movements.

Divers have frequently watched "broken back" shrimp (genus *Spirontocaris*) in their natural habitat. These shrimp are usually found near or beneath bottom debris, and seldom dart away unless nearly or actually touched. When the disturbing object gently contacts a shrimp, it swims a few inches away. Divers have captured individuals by hand. On one occasion, hundreds of "broken back" shrimp were on the bottom near a submerged log. When divers moved through them, the shrimp jumped up to 2 feet off the bottom or sideways using several snapping motions.

● Observed fish behavior.

A primary consideration in developing a sorting trawl is the behavior of fish which are to be sorted. Scuba diving scientists have observed smelt (*Osmeridae*) and Pacific herring (*Clupea harengus pallasii*) many times within the influence of a trawl. In most instances, these fish oriented and swam with the trawl near the uppermost side and top web panels. Escape was usually attempted through the top of the trawl (High and Lusz, 1966). These fish appeared content to swim for long periods in the trawl without tiring or exhibiting distress. But when subjected to sudden diver motions, many fish would dart through upper meshes of the net.

Flounders, on the other hand, invariably swim downward seeking an escape route out of a bottom trawl and seldom rise more than 3 feet from the bottom at any time. Only a small space is necessary between the trawl footrope and ocean floor to allow great numbers of flounders to pass beneath the trawl footrope and escape.

Other near-bottom species, such as Pacific cod (*Gadus macrocephalus*), sablefish (*Anoplopoma fimbria*), spiny dogfish (*Squalus acanthias*), surf-perches (*Embiotocidae*), some species of rockfishes (*Sebastes* spp.), lingcod (*Ophiodon elongatus*), and cabezon (*Scorpaenichthys marmoratus*) respond in a manner between the two extremes. Individuals of all these species have been observed escaping beneath a trawl footrope that was 6 to 12 inches off the bottom. Rarely do any rise more than 15 feet after coming within the trawl's influence in an effort to escape. Usually these species swim ahead of the footrope 2 to 5 feet off the bottom. When the footrope eventually passes beneath them, they turn toward either side of the trawl and, sometimes, rise several feet. All species observed, except smelt and herring, move quickly back to the trawl intermediate or cod end after being totally enclosed by web. Salmon (*Oncorhynchus* spp.) and halibut (*Hippoglossus hippoglossus*) are the only species observed that swam forward and escaped out of the trawl mouth after being more than about 15 feet aft of the footrope.

PRELIMINARY RESEARCH

Limited trials were made by the BCF Juanau Exploratory Fishing and Gear Research Base, and later by the Seattle Exploratory Fishing and Gear Research Base, to deter-

mine if the French-type separator trawl was effective in the North Pacific pink-shrimp fishery. Following these limited trials, which produced inconclusive but encouraging results, an intensive trawl net development program was begun by the Seattle Base. Results of Seattle's program to date are described below.

Model Separator Panel

Two small trawls, a Gulf-of-Mexico shrimp try net, and a one-quarter scale model 57-foot semiballoon trawl were built with horizontal separator panels of 3-inch web leading to upper and lower cod ends. After underwater observations, both trawls were modified. The separator panel was shortened, additional leaded line was attached, and aluminum trawl floats were tied on the trawl top panel to ensure space between the separator panel and the trawl top.

Both nets were tested in Port Susan, Washington, on sparse populations of pink shrimp. Although catches were low, only about 40 percent of the shrimp were in the upper bag of the model and try nets.

57-Foot Semiballoon Separator Trawl

From experience gained with the model trawls, a standard 57-foot semiballoon trawl then was modified with a separator panel and a second cod end. Unfortunately, tests with this modified trawl aboard the trawler 'Tradewind' on commercial shrimp grounds off central Oregon achieved poor separation of shrimp from trash. These results suggested the need for a different method of separating shrimp from trash in the Northwest shrimp fishery.

DEVELOPMENT OF SORTING CONCEPT

Before a successful separator trawl could be developed, it was necessary to further understand the underlying reaction of shrimp and fish to webbing. Therefore, an experimental cruise was conducted with our research vessel John N. Cobb off central Oregon. The primary purpose was to test shrimp trawls with experimental devices for separating shrimp from trash, and to determine behavior patterns of shrimp relating to their capture.

Several trawl configurations were tested. Each was a step toward determining shrimp

reactions and providing a basis for future commercial trawl design. These various configurations were not intended to operate as commercial trawls.

Retaining Covers

As noted earlier, shrimp had been observed hanging partially through wing and top meshes of conventional bottom trawls and 57-foot semiballoon shrimp trawls when retrieved. Their presence indicated that some shrimp escape through the net and that the rate of escape might be very high in areas where the meshes are fully open. Therefore, in an attempt to determine the degree of escapement, small covers were placed over the trawl in strategic places.

Nine-foot square pieces of $\frac{3}{4}$ -inch mesh web were laced at 5 locations to the outside of a 2-inch mesh 57-foot semiballoon shrimp trawl. Each piece covered a $4\frac{1}{2}$ -foot square area, thus creating a pocket to hold shrimp that passed through the larger web. Fig. 1 shows the location of these covers.

In four 30-minute tows, considerably more shrimp were captured in the side covers than in the top covers. The average number of

shrimp in each pocket was: position 1--31.2, position 2--14.2, position 3--66.0, position 4--6.8, and position 5--3.0. The trawl cod end contained an average of 75 pounds of shrimp and 210 pounds of fish.

The results indicate that the greatest escapement occurred near the intermediate. The lack of fish or other trash in any pocket suggests that marine animals other than shrimp may lead along the trawl web, did not contact the trawl in covered areas, or were too large to pass through the webbing.

Side Panel Covers

The purpose of the second experiment was to assess the total amount of escapement through the side panels.

A large panel of $\frac{3}{4}$ -inch mesh web was attached outside each 2-inch mesh trawl side panel from the wingtip to cod end. The panels were laced along the seams in the forward part of the net and departed from the seams aft to retain a constant vertical size (Fig. 2). Near the intermediate, the panels nearly circumscribed the net. Shrimp passed through the trawl web and led aft along the small mesh external cover to special cod ends

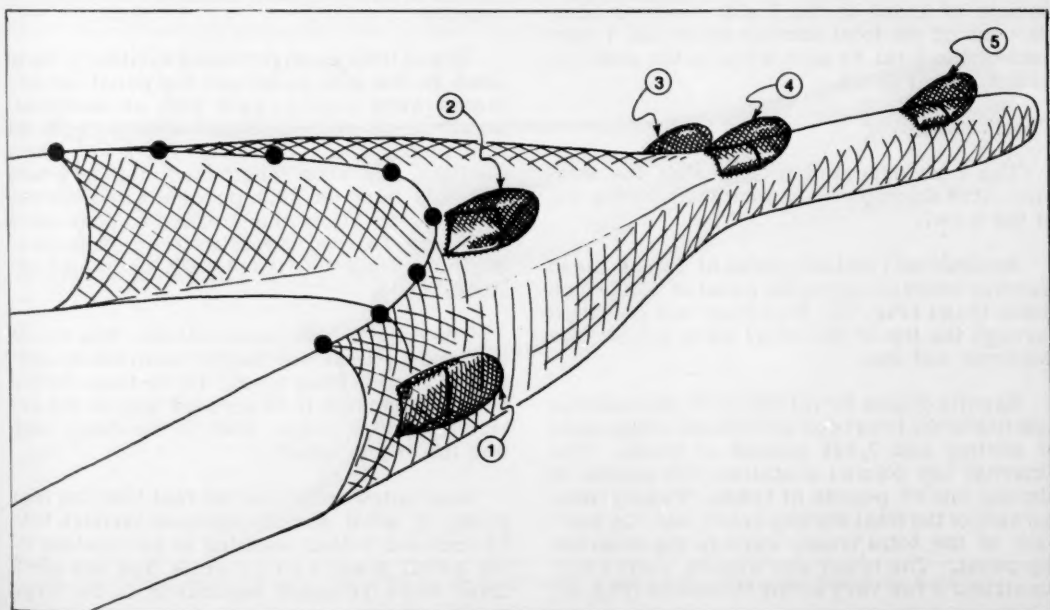


Fig. 1 - Schematic drawing of a 57-foot semiballoon trawl with five small-mesh retainer bags to collect shrimp that passed through trawl meshes.

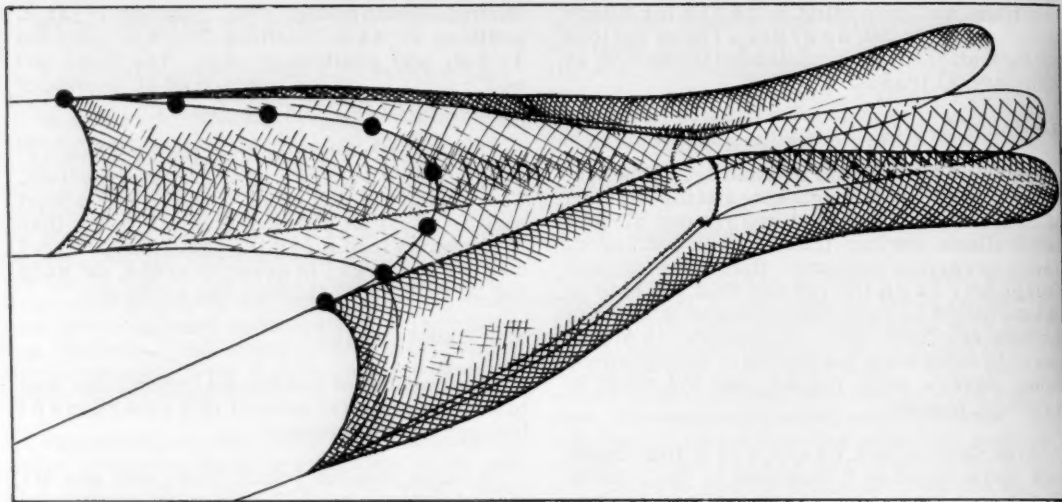


Fig. 2 - A 57-foot semiballoon trawl with exterior covers of $\frac{3}{4}$ -inch web along the side panels terminating in individual cod ends.

terminating each cover panel. Organisms that did not pass through the 2-inch web were lead into the $1\frac{1}{2}$ -inch mesh trawl cod end.

Six 30-minute tows produced 530 pounds of shrimp and 870 pounds of trash in the trawl cod end--and 805 pounds of shrimp and 35 pounds of trash in the 2 side covers. Sixty percent of the total shrimp catch and 4 percent of the total trash were in the exterior side cover (Fig. 3).

Top Panel Cover

The next experiment evaluated the total amount of shrimp escapement through the top of the trawl.

An external retaining panel of $\frac{3}{4}$ -inch mesh web was laced along the top panel of the 2-inch mesh trawl (Fig. 4). Shrimp that passed through the top of the trawl were led aft to a separate cod end.

Results of nine 30-minute tows showed that catches in the trawl cod end totaled 980 pounds of shrimp and 2,655 pounds of trash. The external top panel contained 395 pounds of shrimp and 65 pounds of trash. Twenty-nine percent of the total shrimp catch, and 2.4 percent of the total trash, were in the exterior top panel. The trash was almost entirely smelt and a few very small flounders (Fig. 5).

Combined External Trawl Cover

Catches of nearly pure shrimp in the exterior covers were great enough to suggest this dual web concept as a means to separate shrimp from trash. Consequently, this experiment was designed to enclose all trawl meshes.

Trawl liner configurations similar to those used in the side panel and top panel experiments were combined with an additional small-mesh sleeve placed around the trawl intermediate and cod end. The trawl intermediate was also lengthened, using $1\frac{1}{2}$ -inch web and hung-in 29.3 percent to supporting riblines, to allow the meshes to open more fully and thereby facilitate the passage of shrimp. Only the trawl belly remained unlined.

The results of 4 tows indicated that the 2-inch and $1\frac{1}{2}$ -inch web nearly completely separated shrimp from trash. Of the total shrimp catch, 87 percent to 97 percent was in the external cover bags. Fish in the cover bags was limited to smelt.

Most noteworthy was the fact that the majority of adult shrimp escaped through both $1\frac{1}{2}$ -inch and 2-inch webbing to be retained by the small mesh cover while fish and other trash were retained separately in the large mesh cod end.



Fig. 3 - The combined catch in two covers attached to trawl side panels made up 60 percent of the total shrimp catch. Note the many fish in the trawl cod end, whereas only a few smelt are scattered in the separated catches.

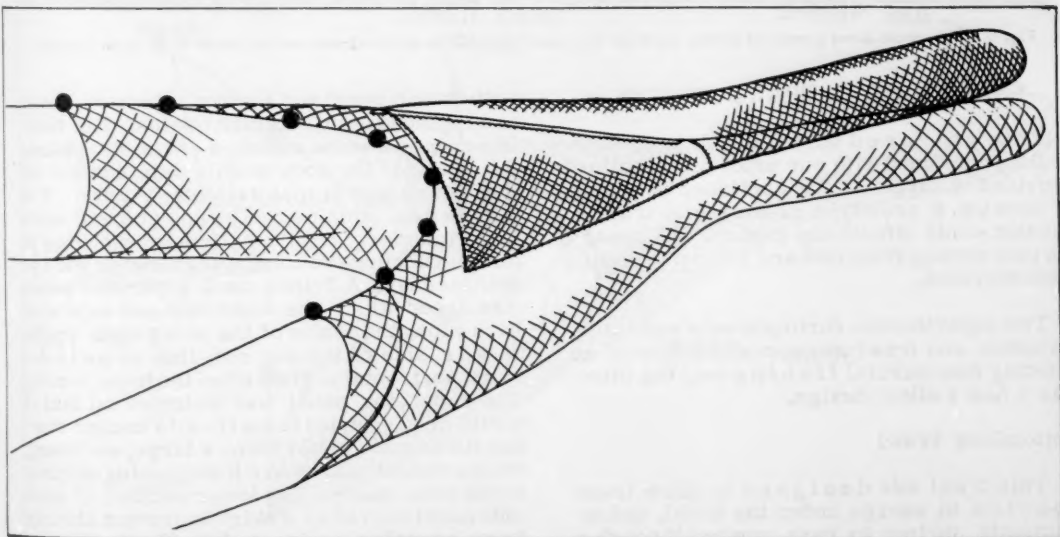


Fig. 4 - A $\frac{3}{4}$ -inch mesh web panel covered the top portion of a trawl to retain shrimp that passed through the trawl web.



Fig. 5 - This photo shows a catch of shrimp and trash that passed through the top trawl web and the catch in the trawl cod end.

EXPERIMENTAL TRAWL DESIGNS

Data gathered during the John N. Cobb cruise, combined with our prior information, provided a direction for continued research to develop a prototype commercial trawl—one that would effectively capture and separate pink shrimp from fish and bottom-dwelling invertebrates.

Two experimental shrimp trawls were constructed: one trawl was a modification of an existing commercial fishing net, the other was a new radical design.

Bottomless Trawl

This trawl was designed to allow trash species to escape under the trawl, and to stimulate shrimp to pass upward through a large mesh separator panel into the cod end.

A 57-foot, conventional, semiballoon shrimp trawl was modified for testing. The

bottom web panel and footrope were removed and replaced with 3 tickler chains. The tickler chains were attached equidistant along the length of the body to stimulate shrimp off the bottom and to maintain trawl shape. The top panel, side panels, and cod end were lined interiorly with small-mesh webbing to prevent shrimp from escaping through the $1\frac{1}{2}$ -inch meshes. A 3-inch mesh separator panel was laced along the headrope and extended back along the center of the side panels to the lower side of the cod end; this created a near-horizontal curtain aft of the trawl mouth. The separator panel was weighted so that it would be suspended in the trawl's center during fishing and would form a large, enclosed, compartment into which swimming shrimp could enter easily. The lower section of each side panel served as a skirt to prevent shrimp from escaping horizontally. The bottom of each side panel was weighted to keep the trawl on bottom.

Fishing trials of the prototype bottomless trawl were conducted on shrimp grounds near Newport, Oregon. To test the efficiency of the experimental trawl, the John N. Cobb made 2 tows adjacent to a commercial trawler, the M/V 'Jaka-B,' which was using a conventional, 57-foot, semiballoon trawl. The comparative tows produced about the same amount of shrimp for each vessel. Owing to low availability of shrimp during the testing period, shrimp catches were very small; therefore, results were not conclusive. Further testing is planned.

BCF Shrimp-Sorting Trawl

In design this new trawl departs radically from conventional shrimp trawls. It has neither a top nor bottom panel but a double wall of webbing in the wings to separate shrimp from fish and bottom debris (Fig. 6). The inner panels of the double-walled wings are of meshes large enough for shrimp to pass through, and the outer panels are of meshes small enough to retain the sorted catch. Size of shrimp contained in the outer bag would naturally be governed by mesh size. Smelt and other fish that tend to swim upward could pass over the top of the new trawl.

Fish and debris that did not pass through the large meshes of the inner panel in the wings eventually pass through a trash chute out of the trawl unharmed. Because all shrimp were not expected to pass through the wing sieve web, the trash chute was constructed of large-mesh web, which would allow some of these shrimp to go into the retainer bag. Those shrimp that continued through the chute without passing through any meshes would eventually be captured in the trash bag, or deposited back onto the sea bed if the external portion of the chute was not closed.

After construction of the new trawl, diver observations determined that the overall configuration was adequate for testing.

Fishing Trials

Initial field trials of the BCF shrimp-sorting trawl were conducted on shrimp beds off Newport, Oregon. These were reported to have small-to-moderate amounts of shrimp but large amounts of trash fish and sea urchins. The John N. Cobb made 9 tows with the net. In every tow, the trash content of the separated shrimp catches was less than 3 percent by weight, and no sea urchins were

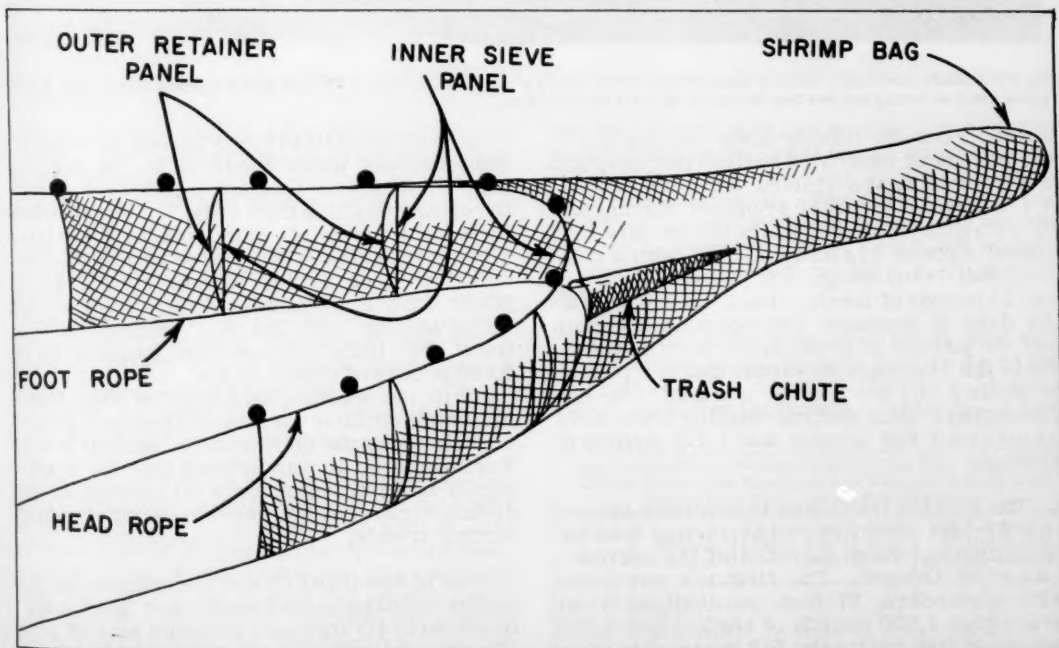


Fig. 6 - Schematic drawing of the BCF shrimp sorting trawl featuring long double panel wings and a short trash chute.



Fig. 7 - A nearly pure shrimp catch is dumped from a BCF shrimp sorting trawl onto the M/V Washington's sorting table. This 2,000-pound catch of shrimp had less than 20 pounds of smelt and flounders.

taken. Four 30-minute tows yielded 555 to 735 pounds of separated shrimp per tow, and one 30-minute tow yielded only 265 pounds. A 1-hour tow caught 610 pounds of shrimp and 15 pounds of trash, while the commercial vessel Jaka-B fishing nearby with a conventional trawl caught 500 pounds of shrimp and 55 pounds of trash. One 2-hour tow near the Jaka-B produced 780 pounds of shrimp and 25 pounds of trash in the sorting trawl, while the commercial vessel had 800 pounds of shrimp and 390 pounds of trash. The two remaining 2-hour shrimp-sorting trawl tows produced 625 pounds and 1,825 pounds of shrimp.

The sorting trawl was then placed aboard the 65-foot commercial shrimp trawler 'Washington,' which operated off the northern coast of Oregon. The first tow was made with a standard, 57-foot, semiballoon trawl which took 1,400 pounds of shrimp and 4,900 pounds of fish and trash. In 8 succeeding tows with the BCF shrimp-sorting trawl, catches

ranged from 1,000 to 2,000 pounds of shrimp. Four percent trash occurred in one evening tow; 1 percent or less trash was captured in the other 7 daytime tows (Fig. 7). All catches included many small, gray, cragionid shrimp. Tows in the same general area and of similar duration made by the 'Trask' and 'Western Maid' using conventional shrimp trawls took more shrimp than the BCF shrimp-sorting trawl, but their catches also included up to 5,000 pounds of trash per tow. On the following trip, the Washington using the wing trawl also made smaller catches of shrimp than did vessels using the conventional shrimp trawl. Furthermore, it was noticed that the Washington often traveled only 60 percent of the distance covered by vessels using standard shrimp trawls.

Use of the trawl by the Washington on the 2 trips indicated a need for further gear modifications to (1) increase average size of pink shrimp captured by using web with larger meshes in the inner and outer panels, (2)



Fig. 8 - This 1,500-pound catch of shrimp could be dumped into the vessel's hold after washing without time-consuming hand sorting.

reduce incidental catch of unwanted cragonid shrimp, (3) improve handling alongside the vessel by lengthening the shrimp bag, and (4) increase the catch of pink shrimp.

A second wing trawl was then constructed and tested aboard the Washington. It also had a 100-foot headrope and 106-foot footrope. The wings as observed by scuba divers opened about 5 feet vertically. The inner panel wings were of 2-inch No. 12 knotted nylon. Outer panel wings of $\frac{7}{8}$ -inch knotless nylon were attached to $1\frac{1}{16}$ -inch No. 18 knotted nylon in the body and shrimp bag sections.

Fishing trials with the modified sorting trawl continued to demonstrate the potential of this design. Catches, although still smaller than those of nearby trawlers, were of commercial size. Almost no trash was captured with the sorting trawl, and the shrimp could be placed directly into the hold for icing without sorting (Fig. 8). On the first day, the catch rates were 1,460 pounds per hour by

the Washington with the sorting trawl, 1,380 pounds per hour by Trask (conventional trawl), and 1,285 pounds per hour by Western Maid (conventional trawl). The following day the Washington made 2 tows and took 805 pounds per hour, while the Trask took 2,380 pounds per hour, and the Western Maid 2,100 pounds per hour.

The BCF shrimp-sorting trawl still retained some small shrimp because of its $1\frac{1}{16}$ -inch retainer web as compared to $1\frac{1}{2}$ -inch web of commercial trawls. Table shows age

Age Composition of Shrimp Taken October 8-9, 1968, in A 57-Foot Semiballoon Trawl and A BCF Shrimp-Sorting Trawl (Unpublished Data, Oregon Fish Commission)			
Age	Carpae Length	57-Foot Semiballoon Trawl with $1\frac{1}{2}$ -Inch Web	BCF Shrimp-Sorting Trawl with $1\frac{1}{16}$ -Inch Web
	mm.	%	%
1	15.5-17.5	3.5	7.0
2	18.0-21.5	61.3	62.2
3 & older	22.0-25.0	35.1	30.8

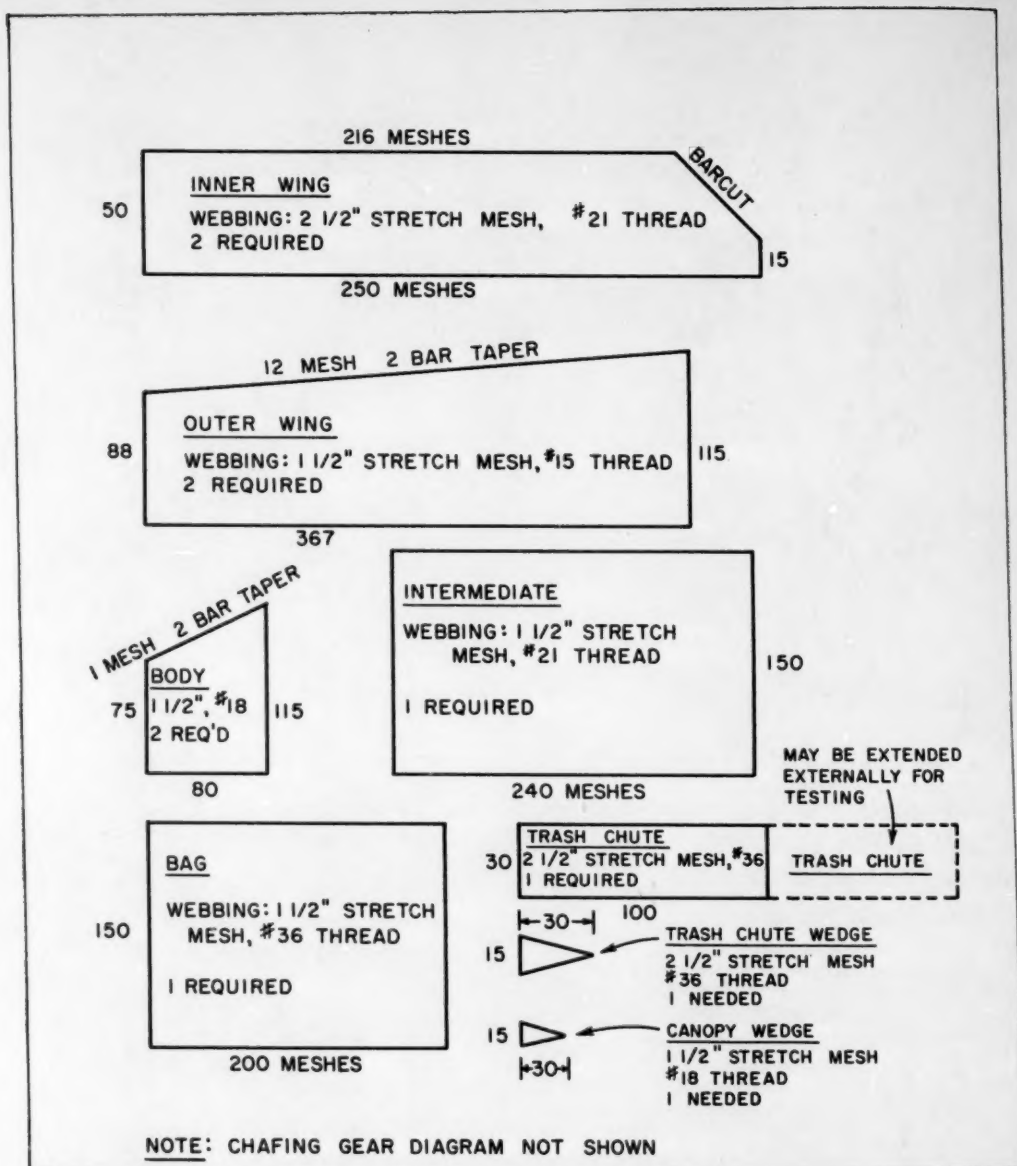


Fig. 9 - Sample cutting diagram for BCF shrimp sorting trawl.

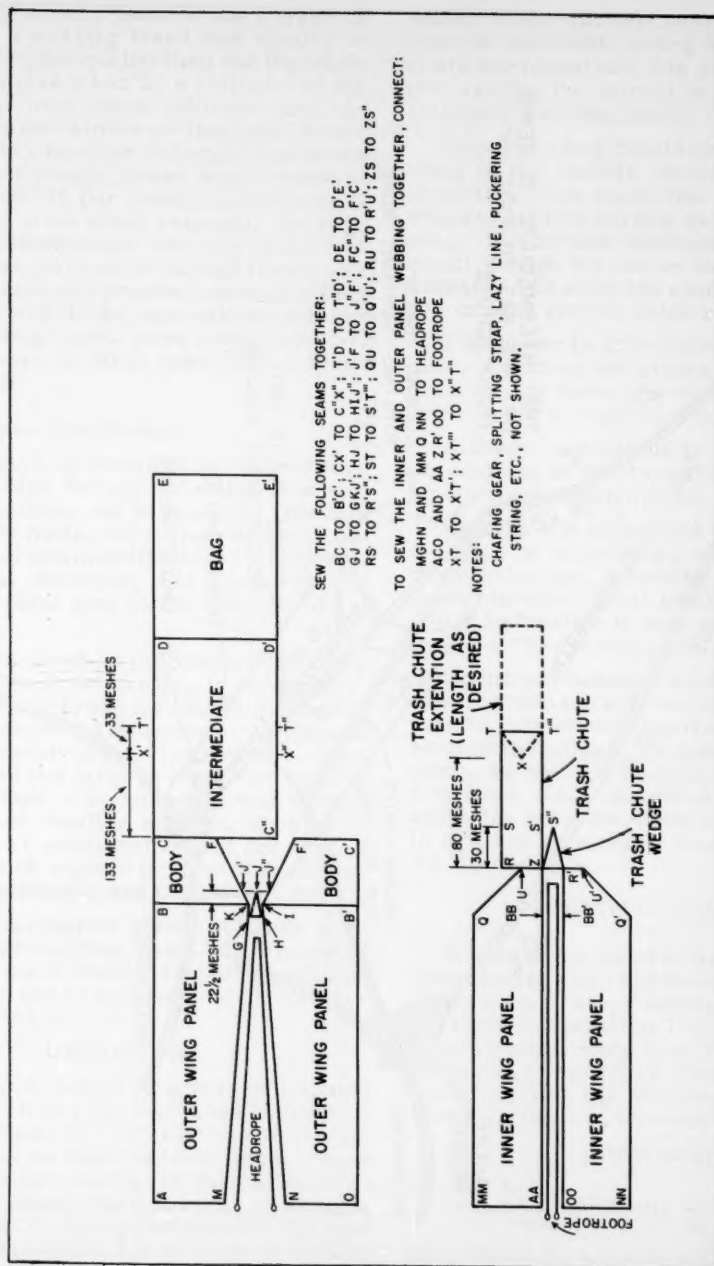


Fig. 10 - Sample construction plans for BCF shrimp sorting trawl.

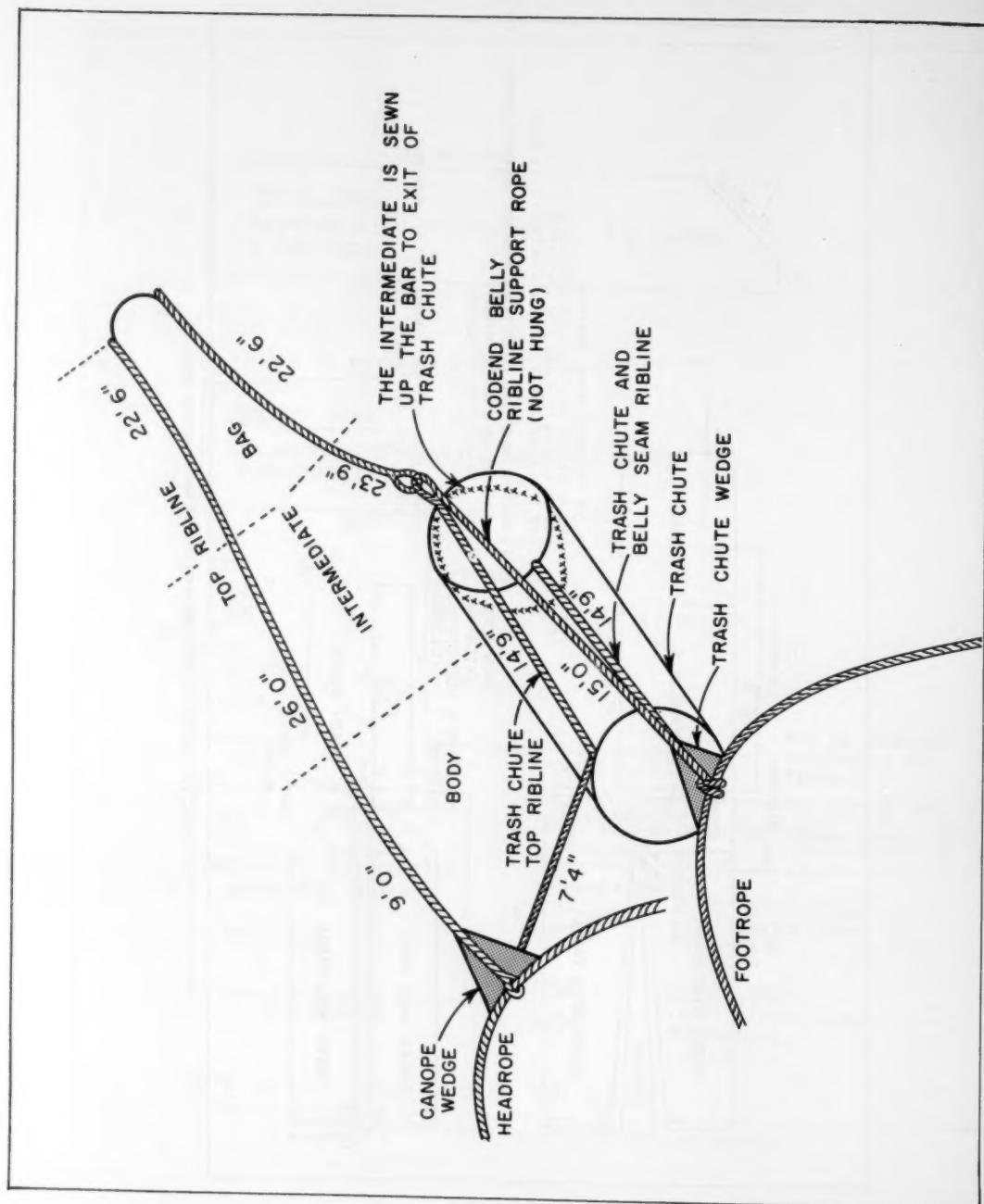


Fig. 11 - Details of riblines and trash chutes for the BCF shrimp sorting trawl.

composition of shrimp taken in the 2 types of trawls. The sorting trawl took shrimp of considerably higher quality than did the other vessels. Samples taken by a biologist of the Oregon Fish Commission indicated that, although shrimp taken in the sorting trawl averaged slightly smaller in length than those taken in shrimp trawls, fewer were needed to weigh a pound (75 per pound, in contrast to 81 per pound from other vessels). He suggested this phenomenon was due to the fact that shrimp caught by conventional trawls are frequently broken and crushed, causing a loss of body parts and fluids, whereas those taken with the sorting trawl were undamaged because there were no large quantities of trash in the cod end.

Sample Construction Method

The BCF shrimp-sorting trawl cannot have the same design for all fisheries. Factors such as vessel size and horsepower, species fished, type of trash, and bottom composition will dictate certain modifications for greatest efficiency. However, it is appropriate to present a typical plan to show methods of construction.

Fishermen considering construction of a sorting trawl must realize this is an illustrative design. It is not necessarily intended for use in commercial fisheries in its present form. The sample trawl illustrated here might apply to the large prawns typically found in the Gulf of Mexico, whereas a trawl constructed of smaller meshes, such as 2-inch for inner panel and 1-inch for outer panel, would be appropriate for pink shrimp along the Washington and Oregon coasts.

The cutting diagram shown in figure 9 includes each web section required. Figure 10 illustrates the web attachment points. Ribline configuration and trash chute details are shown in figure 11.

DISCUSSION

Despite lower catch rates, it is anticipated that design changes will bring harvesting rates up to those of conventional shrimp trawls. Even in their present form, trawls employing the new concept in shrimp separation in their design have several advantages for use in Pacific Northwest waters: (1) less manpower is required due to reduced sorting time, (2) fishing time is not lost to sorting shrimp from trash, and fishing may be ex-

tended to hours of darkness, (3) grounds considered unfishable owing to excessive trash can be harvested with this gear, and (4) product reaching the market is superior and may command a higher price.

Two sorting trawls are now undergoing tests in the Pacific Northwest pink-shrimp fisheries. One trawl has somewhat higher wings to capture shrimp several feet off bottom. The 50-foot headrope makes the trawl small enough for use by low-horsepower vessels. The other has a modified trash chute to increase shrimp catch rates.

This paper is as an interim report. Additional studies and at-sea fishing trials are underway to develop a shrimp-sorting trawl suitable for commercial fishing.

Fishery regulations in some regions now prevent use of this type trawl because of the small-mesh construction.

Designs are completed for sorting trawls modified to cope with conditions existing in other fisheries. Information gained thus far in the developmental program suggests that it may be feasible to sort small shrimp from larger shrimp through use of multiple sieving.

Additional behavior studies were begun in January 1969 and will continue throughout the year to further develop trawls using the new sorting principle. To accelerate this program, we will use underwater television and automatic deepwater cameras to learn more about the behavior of shrimp to fishing gear in situ, and then relate these observations to the trawl design.

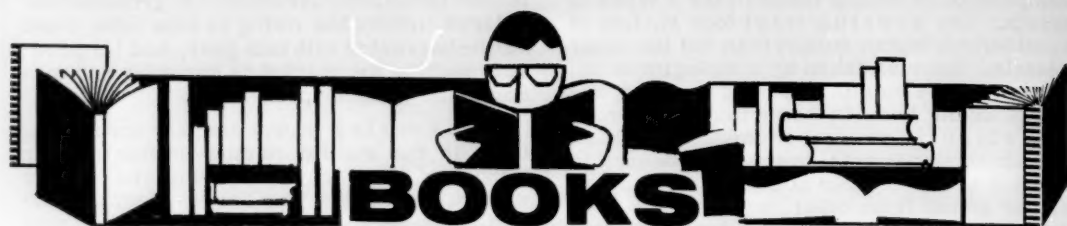
ACKNOWLEDGMENTS

We thank the captains and crews of the commercial shrimp trawlers, Washington, Tradewind, Trask, Western Maid, and Jaka-B for their cooperation during field trials of experimental nets; Jack Robinson, Fishery Biologist, Oregon Fish Commission, who collected shrimp age and size information; and Steve Marinovich, who supplied model trawls.

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ANTARCTIC

'An Ostracod Fauna from Halley Bay, Coats Land, British Antarctic Territory,' by J. W. Neale, British Antarctic Survey, Scientific Report No. 58, London, 1967, 50 pp., illus., \$3.36.

Twenty-six species of podocypid ostracods are present in a high Antarctic fauna obtained from Halley Bay. Diagnoses are given of the two new genera 'Antarcticythere' and 'Myrena.' The new species 'Cativella ben-sone,' 'Loxocythere frigida' and 'Robertsonites antarcticus' are described. Comparisons are made with other described fauna from the Antarctic.

MARINE MAMMALS

'The World of the Walrus,' by Richard Perry, Taplinger Publ. Co., New York, 1967, 162 pp., illus., \$5.95.

For a thousand years, since the days when the Vikings were hunting the hvalross, or whale-horse, off the North Cape early in the ninth century, man has persecuted the walrus relentlessly. During the past 100 years, between 2 and 3 million walruses have been slaughtered in the Bering Sea alone; no one has calculated how many more in the Canadian and Norwegian Arctic. By the 1930s, their world population was less than 100,000; their continued existence as a living species was endangered.

Despite this record, our knowledge of the walrus life history is both fragmentary and confused. It is extremely difficult to maintain contact with the herds among the remote icefields, and they do not breed ashore in vast rookeries as do their relatives, the fur seals and sea lions. Nevertheless, a mass of material has been gathered by zoologists, much of it both circumstantial and contradictory. Mr. Perry has straightened out this maze of

fact and inference to expose the unexpected fact of walrus life and society.

MODERN FISHERIES

'Science for Better Living,' Yearbook of Agriculture, Dept. of Agriculture, 1968. U.S. Govt. Printing Office, Washington, D.C., 386 pp., illus., \$3.

This Yearbook takes a very broad view of agricultural research. Subjects range from the alfalfa bee to the weed-eating sea cow, from balloon logging to WURLAN wool fabric, from a low-calorie cheese to farming by space satellite.

The intricacies of managing fishery resources and harvesting food from the sea and inland waters are covered in a chapter written by Dr. Sidney Shapiro, BCF's special assistant for resource development. It deals with numerous modern developments in fishery biology and technology: for example, productivity of the sea, underwater marine research, spacecraft oceanography, and fish culture.

OCEANOGRAPHY

'The Ever-Changing Sea,' by David B. Ericson and Goesta Willin, illustrated by Ingrid Niccoll, Alfred A. Knopf, New York, 1967, 349 pp., \$7.95.

Revelations of the past two decades about the oceans--their depths, currents, topography, and their origins--have given us more knowledge than had been acquired in all the millenia since venturesome upper-paleolithic men first set out upon the depths in skin boats. David Ericson and Goesta Willin, themselves distinguished oceanographers, have brought the story up to date.

They tell how new equipment and ingenious instruments, such as the echo sounder, the

corer, and the seismic profiler, have brought to the surface data that give an utterly new view of the sea's secrets. From this new knowledge has come an understanding of other fields of learning. This book illustrates how the study of the sea and its terrain has given insights into the physical evolution of the earth itself, evidence about the formation of continents, the nature of the earth's crust, the beginnings of life, life in the great depths today, and the 'new economics of the oceans.'

'Oceanography of Baffin Bay and Nares Strait in the Summer of 1966 and Current Measurements in Smith Sound, Summer 1963,' by Kennard M. Palfrey, Jr. and Godfrey Day, U.S. Coast Guard Oceanographic Report No. 16, U.S. Govt. Printing Office, Washington, D.C., 1968, 204 pp., illus.

The summer of 1966 climaxed the most unusual year in the history of the International Ice Patrol, by virtue of a phenomenal lack of ice and abnormally warm temperatures. This report attempts to document the oceanographic conditions in Baffin Bay at that time, including data collected during a comprehensive and synoptic investigation of Baffin Bay and Nares Strait. Measurements of temperature, salinity, and dissolved oxygen are presented, emphasizing the development of the circulation of Baffin Bay.

OCEAN BIRDS

'Birds of the Atlantic Ocean,' by Ted Stokes, illustrated by Keith Shackleton, Macmillan Co., New York, 1968, 156 pp., \$12.95.

This book offers the most complete collection of illustrations of ocean birds ever published. The celebrated British painter and illustrator Keith Shackleton has included reproductions of 15 of his oil portraits of birds of the Atlantic ocean in full flight. To these have been added 23 plates of gouache drawings pointing up each bird's distinguishing characteristics and features of special interest.

The birds run the full gamut from penguins, albatrosses, petrels, tropic birds, and pelicans to cormorants, frigate birds, phalaropes, skuas, gulls, terns, skimmers, and auks. Mr. Stokes, a well-known oceanbird enthusiast, presents the birds in correct systematic sequence, giving their order, family, species, and common names.

OIL POLLUTION

'Manual on the Avoidance of Pollution of the Sea by Oil,' Great Britain Board of Trade, London, 1967, 22 pp., 2 charts. Her Majesty's Stationery Office, 30¢.

In recent years, strenuous efforts have been made, both nationally and internationally, to solve the problem of oil pollution. By November 1967, 36 countries had accepted an International Convention for the Prevention of Pollution of the Sea by Oil. The provisions of the Convention have been given legal effect for British ships registered in the U.K.

The law can impose penalties, but pollution of the sea will cease only if every master, officer, and seaman--and those on shore who transfer oil to and from ships--do all they can to prevent oil getting into it. This manual seeks to assist them by setting out methods of avoiding the discharge, spillage, or leakage of oil.

FISH PASSAGE THROUGH TURBINES

'Diel Movement and Vertical Distribution of Juvenile Anadromous Fish in Turbine Intakes,' by Clifford W. Long, Fishery Bulletin, Vol. 66, No. 3, Fish and Wildlife Service, Dept. of the Interior, 1968, pp. 599-609, illus. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

The behavior of fingerling salmonids in turbine intakes, including their time of passage and distribution in the water mass, can profoundly influence development of efficient and economical methods for reducing fish mortality in turbines. The need for fish protection at dams is becoming particularly acute in the Columbia Basin because the progeny of upriver stocks of salmonids soon will be forced to pass through the turbines of 8 to 10 dams to reach the sea. This paper reports on experiments at 2 dams on the Columbia River to acquire data on timing and distribution of fingerling salmonids entering turbine intakes.

'A Compendium on the Success of Passage of Small Fish through Turbines,' by Milo C. Bell, Allen C. DeLacy, Gerald J. Paulik, and Richard A. Winnor, Fisheries Engineering Research Program, U.S. Army Engineering Division, North Pacific Corps of Engineers, Portland, Ore., May 1967, 268 pp., illus.

Hydroelectric development on watersheds containing indigenous populations of anadromous fish causes concern for the safety of juvenile forms that must pass through penstocks and turbines on their way to the sea. Many investigations have been undertaken over the years to determine levels of turbine mortality and the causative factors at specific projects. This report presents an analysis of existing information and makes recommendations for future work.

ANIMAL NAVIGATION

'Animal Orientation and Navigation: Proceedings of the 27th Annual/Biology Colloquium, Mar. 6-7, 1966,' edited by Robert M. Storm, Oregon State Univ. Press, 1967, 134 pp., illus.

This book records a conference held to bring together several active researchers in vertebrate orientation and navigation so that they might present a timely review of accomplishments and remaining problems.

Dr. Arthur D. Hasler reviews his research on fish orientation, stressing their use of olfactory and visual clues. Dr. Denzel Ferguson discusses sun orientation by frogs and toads. Dr. Archie Carr reviews research on sea-turtle orientation and navigation. Dr. Kenneth S. Norris reviews the known migrations of marine mammals and the navigation problems involved, the known orientation mechanisms, and he speculates on others that may be operative. Other papers discuss certain aspects of migration by birds.

PARASITES

'Some Parasites of O-Group Plaice, *Pleuronectes platessa* L., under Different Environmental Conditions,' by K. MacKenzie, Dept. of Agriculture and Fisheries for Scotland, Marine Research Report No. 3, 1968, 23 pp., illus., \$1.40. Her Majesty's Stationery Office, Edinburgh.

The parasites of O-group plaice, living under artificial conditions in open-mesh submerged tanks in a sea loch on Scotland's west coast, are compared with those of the natural population of O-group plaice in the same loch. From the 263 plaice examined in this study, 19 species of parasites were recorded.

The report gives data on the incidence and intensity of infestation of each parasite. It

discusses the potentially harmful parasites of young plaice under intensive fish-farming conditions.

PLANKTON

'Dinoflagellates of the Caribbean Sea and Adjacent Areas,' by E. J. Ferguson Wood, Univ. of Miami Press, 1969, 144 pp., illus., \$12.

Dinoflagellates, microscopic, single-celled, plantlike organisms, form a significant element among the plankton. They are important in marine food chains and are of interest to marine biologists and to researchers in many other fields.

Students of the Caribbean region ecology, and even nonspecialists in marine microbiology, will be able to identify specimens of dinoflagellates found in plankton catches by using this atlas and guide. Dr. Wood describes and gives locations for 400 species. The detailed illustrations are particularly useful for identification purposes. There is an appendix treating the 6 species of Silboflagellates that have been recorded in the Caribbean.

PROCESSING

'Sanitation Guidelines for the Breaded-Shrimp Industry,' by Joe P. Clem and E. Spencer Garrett, 14 pp., illus., Circular 308, 1968. Fish and Wildlife Service, Dept. of the Interior. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

The ever-increasing application of technology by the food-processing industry makes the sanitation measures used some years ago inadequate. As processing becomes more complex and sophisticated, so do the sanitation problems. Large numbers of workers standing along the processing lines handle the product. If any one of them is guilty of the slightest hygienic malpractice, he may contaminate the product and affect the health of hundreds of consumers.

The solution lies in rigid control of plant sanitation. Sanitation-control measures are not merely cleaning procedures. They involve all procedures ensuring that a finished product will reach the consumer in the best possible condition. The guidelines cover physical plant requirements, cleaning procedures, operating procedures, and the need for personal hygiene.

SEA URCHINS

'Systematics of Sympatric Species in West Indian Spatangoids: Studies in Tropical Oceanography No. 7,' by Richard H. Chesher, Univ. of Miami Press, 1968, 168 pp., illus., \$12.

Sea urchins have long excited the interest of zoologists and paleontologists. Spatangoid sea urchins are important links in the recycling of nutrients trapped in sediments and provide food for a great variety of marine life. They burrow in sand or mud, from just below low tide mark out to great depths. Marine fossil deposits often contain large numbers, but the burrowing habits that ensure their entombment also effectively protect them from the eyes and dredges of marine biologists.

Dr. Chesher's study deals with ten species and subspecies belonging to four genera. Three of the species are new to science. Each species is described, measured, and mathematically analyzed in detail, establishing on a firm basis the systematics and biology of this previously poorly known group.

The book should prove invaluable to marine biologists and ecologists, to those interested in the biology and evolution of echinoderms, and to museum workers concerned with accurate identification of species.

VENEZUELA

'The Present Status of the Sardine and Tuna Fisheries of Venezuela,' by Raymond C. Griffiths and John G. Simpson, FAO Fisheries Research and Development Project,

Caracas, 1968. (Reprinted from 'Proc. of Gulf and Crib. Fish. Inst.,' Nov. 1967, pp. 159-177, illus.)

In contrast to the relatively primitive sardine fishery, the tuna fishery is one of the more advanced in Venezuela. This report briefly describes each fishery showing the catch, fishing effort, and the relation between them. Specific components of the catch, seasonal migrations, dependence of school size on population density and new fishing methods are discussed.

Griffiths and Simpson also consider the possible difference between the two main fishing areas and the migrations of fish between them, the effects of upwelling, and the low radius of action of the fleet.

CHROMATOGRAPHY

'Quantitative Thin-Layer Chromatography of Chlorophylls and Carotenoids from Marine Algae,' by S. W. Jeffrey, CSIRO, Australia, (Reprinted from 'Biochim. Biophys. Acta.,' Vol. 162, No. 2, pp. 271-285, Aug. 1968.)

A quantitative chromatographic method for determining microgram quantities of chlorophylls and carotenoids in planktonic marine algae has long been needed. This is a report on a chromatographic method that separates each pigment fraction for quantitative analyses and that can also be used to test the validity of spectrophotometric equations used for chlorophyll analyses in marine algae and in higher plants. Mr. Jeffrey describes the preparation and properties of the sucrose thin-layer plate, the quantitative procedures used, and some applications of method.

--Barbara Lundy



INTERNATIONAL

International Fisheries Survey Off California Underway

Research vessels of BCF, the Scripps Institution of Oceanography (La Jolla, Calif.), and the Far Eastern Seas Fisheries Research Institute of the USSR are cooperating in an international fisheries survey off California. The survey began in February 1969 and will end this month.

Its purpose is to assess the populations of Pacific hake, a species heavily fished by Soviet fleets in recent years. The U.S. recognizes hake as a valuable raw material for fish protein concentrate (FPC). The information is required to provide the scientific basis for agreements to protect the resource.

The Vessels

Participating vessels are the 'Miller Freeman,' operated by the BCF Laboratory in Seattle, Wash., 'David Starr Jordan' of the BCF Fishery-Oceanography Center at La Jolla, the 'Alexander Agassiz' from Scripps, and 'Professor Deryugin,' based at the Soviet agency's Vladivostok Laboratory.

Dr. Alan R. Longhurst, Director of the BCF Laboratory at La Jolla, is U.S. coordinator. Dr. Y. U. Yermakov, a fishery biologist with wide experience in this area, is chief scientist aboard Professor Deryugin. The vessel was scheduled to arrive at the Port of Los Angeles early in March to take on scientific sampling gear and for discussions with U.S. scientists.

All 4 vessels are equipped with the latest scientific gear for fisheries research.

The Hake Resource

In early spring, most of the adult Pacific hake population from British Columbia to Mexico gather off southern California and Baja California to breed. Eggs and young float in the water and are easily captured in plankton and counted. This "census" provides the basis for an estimate of the abundance of adult fish.

In past years, research vessels from the Fishery-Oceanography Center and Scripps have used this method to gather preliminary

data on Pacific hake. However, the 2 institutions were never able to cover an area large enough to obtain definitive results. With 4 ships, the scientists will be able to survey quickly a much larger area than ever before. They will obtain more accurate estimates of the total hake population. The information is necessary to conserve and manage the resource.

In recent years, representatives of the two countries have alternated visits. They have met about twice a year to exchange scientific data from survey and research work in the preceding year on species of mutual concern, such as hake and Pacific ocean perch. They also discussed the apparent effect of the year's fishery on these species. The information developed formed the basis of discussions in working out fishing agreements aimed at protecting these fishery resources.

At the most recent meeting, held in November 1968 in Moscow, the scientists recommended a joint attempt to determine the size of the Pacific hake population--and plans for the survey developed from that suggestion.



Japanese Exploratory Fishing Off Chile

The government research vessel 'Kaiyo Maru' (3,200 gross tons) left Japan Nov. 1, 1968, on a survey cruise to the west coast of South America. On Jan. 10, 1969, she was trawling around 25° S. latitude and 74° W. longitude off Chile, taking merluza (hake), mackerel, and sharks. She has not found any sizable concentration of bottomfish--primary objective of the expedition. ('Shin Suisan Shimbun Sokuho,' Jan. 14, 1969.)

Longliner Finds Big-Eyed Tuna

In May 1968, the longliner 'Azuma Maru No. 31' (340 gross tons) began exploring off Chile on a government-subsidized tuna survey. She now has concluded operations. Her primary objective was to develop new southern bluefin grounds, but results were disappointing--only 10 bluefin were taken. However, the survey did locate big-eyed tuna

schools of sufficient density to support commercial operations. Azuma Maru No. 31 caught 252 tons of fish--big-eyed, 145 tons; albacore, 41 tons; and other fish, including southern bluefin, 66 tons. ('Katsuo-maguro Tsushin,' Jan. 20, 1969.)



Japanese Seek More Joint Shrimp Ventures in Indonesia

Following Toho Suisan Fishing Co.'s establishment of a joint fishery enterprise in Indonesia in late 1968, several major Japanese fishing and trading firms are seeking similar fishing ventures. Among others, Toyo Menka, Nihon Kinkai Hoge, Taiyo, and Nihon Suisan are arranging to join Indonesian interests in large-scale fishing ventures. Most plans involve shrimp fishing and, if all the proposed enterprises materialize, some Japanese foresee the possibility of an oversupply in Japan.

Japanese Firms Already Licensed

Toyo Menka, a large trading firm, is exploring for Indonesian shrimp with the Kyokuyo Hoge Fishing Co. The 2 firms plan to establish the largest Japanese fishing enterprise there, employing 200 fishing vessels. Nihon Kinkai Hoge plans to join the Indonesian Eramina (phonetic) Distant-Water Fishing Co. to establish a US\$1 million company to fish shrimp off northeast Kalimantan. The Indonesian government has already granted a license, and trial fishing should start soon. Taiyo and Nihon Suisan have applied for a license to fish shrimp off West Irian's southern coast.

UN/FAO Financial Backing

The U.S. Food and Agriculture Organization (FAO) is offering a US\$1 million loan for joint development of Indonesian fisheries. It has invited fishing firms in Japan and other countries to participate. Several Japanese firms have submitted plans which FAO is studying.

Shrimp Fishery Ripe for Development

Indonesian waters, with numerous scattered islands and bays, are ideally suited to

shrimp propagation. The environment promotes rapid growth of such species as tiger, banana, and white shrimp. Indonesia is said to consider promotion of shrimp and other fisheries vital to its economic development. It welcomes Japanese assistance to local fishermen. This is why so many Japanese firms are planning joint enterprises there. However, since the government has 'sliced' the surrounding waters into small areas in issuing fishing licenses, there is concern about the successful operation of new ventures. ('Nihon Keizai Shimbun,' Jan. 22, 1969.)



Canada to Host Fishery Products Inspection Conference

Consumer protection will be strengthened by an international technical conference on fish inspection and quality control to be held in Halifax, Nova Scotia, Canada, July 15-25, 1969. It is sponsored by the Food and Agriculture Organization (FAO) of the United Nations. It is open to all FAO members and associates. Cooperating U.S. agencies include the Departments of State; Health, Education, and Welfare; Defense; and Interior.

Main Objectives

The main objectives are to consider all aspects of fish inspection--including staff organization and training, quality control, new inspection techniques, and new approaches to quality assessment. Fish-inspection methods in various segments of the industry will be compared. Techniques and methods sufficiently accepted to have possible use internationally will be emphasized.

FAO has said that the growing international trade in fishery products and other foods points up need for international standards. Waste and quality degradation often may be avoided by advice from trained inspection personnel who can pinpoint problems and correct them.

A Technical Conference

The conference will be conducted in English, French, and Spanish, the official FAO languages. Simultaneous interpretation will

be provided. Scientific papers will be accepted in any official language and be reproduced in that language with abstracts in the other two.

Because it is a technical conference, governments have been invited to nominate experts. FAO has recommended that participants come from Federal and State fish-inspection agencies, public and private research institutions, and the fishing industry. Other specialists who want to attend as individuals must arrange it in their own countries.

U.S. residents who wish to attend should request registration forms and information from Joseph W. Slavin, Assistant Director for Utilization and Engineering, Bureau of Commercial Fisheries, U.S. Department of the Interior, Washington, D. C. 20240.



East Germany Delivers Stern Trawler to Cuba

On Jan. 10, 1969, East Germany turned over to Cuba the large stern freezer trawler 'Playa Giron.' The vessel was accepted from the Stralsund People's Shipyards by H. Rodriguez, the Cuban Ambassador to East Germany.

The Vessel

'Playa Giron,' 3,200 gross tons, is 82.2 meters (269.6 ft.) long; her engines generate 2,630 hp. and she can make 13.6 knots. Her maximum processing capacity is 80 metric tons of fish a day. She can freeze 50 metric tons of fish a day and transport 1,450 tons of finished products.

Playa Giron is the first Cuban fishing vessel of this size. Four more are on order in East Germany.



Cuban Fishing Vessel Seized by Venezuela

The Cuban longliner 'Alecrin' was shot up and seized on Nov. 20, 1968, by 2 Venezuelan warships off Los Testigos Islands, 50 miles north of Venezuela. Cuba bought the 575-gross-ton vessel and 19 other tuna vessels from Spain in 1966. The Alecrin was carrying a crew of 38, including a Japanese instructor who has been working with the Cuban fleet for 2 years.

Venezuela reported to the United Nations that the Alecrin was 8 miles northeast of Los Testigos Islands, inside 12-mile territorial waters, when spotted by the 2 warships. Ordered to stop and identify herself, the vessel attempted to escape. Warning shots fired across her bow were ignored. The warships opened fire and forced Alecrin to stop. The Cuban vessel was boarded and taken to Carupano for inspection. The vessel was damaged, but no one was hurt.

Since Cuba has been committing illegal acts of direct intervention and subversion against Venezuela for years, Venezuela is vigilantly patrolling her territorial waters.

Cuba's Strong Reaction

Cuba reacted angrily. She placed the Alecrin considerably north of Los Testigos, in international waters. Cuba claims there were 5 other Cuban tuna boats in the area, that Alecrin had been fishing there 51 days and was carrying 90 tons of fish in her refrigerated holds. Cuba protested strongly to the Swiss representative, who cares for Venezuelan interests in Havana, and with UN. The seizure was called piracy.

No Sabotage Mission

Venezuelan investigation failed to produce evidence that Alecrin was engaged in a sabotage mission. On Dec. 13, 1968, the President of Venezuela personally ordered the vessel released. She sailed for Cuba on Dec. 20, one month after her seizure. Two of her crew requested asylum in Venezuela.

As an aftermath of the Alecrin incident, the Cuban government charged Venezuela's government-owned airline \$31,500 for the return of a DC-9 jetliner hijacked to Cuba on Feb. 11, 1969. The charge is considered a reprisal for the Alecrin seizure. ("The Washington Post," Feb. 18, 1969.)



FOREIGN

CANADA

LOBSTER VESSELS WILL BE LICENSED

In a move to raise lobster fishermen's earnings, an upper limit has been placed on the number of boats licensed to fish lobsters in the Maritime Provinces in 1969 and future years. Licenses will be issued only for boats registered with the Federal Department of Fisheries to fish lobsters in Maritime waters in 1968. The only additional lobster boats that may enter the fishery this year are those that were under construction, or under contract for construction, prior to Jan. 20, 1969. The lobster license stays with the boat. When an owner sells his boat to another fisherman, he withdraws from the fishery and the buyer will be able to enter it.

Trap Limits

The lobster fishery is based on a resource that is fully exploited already and whose future growth is limited by biological factors. With such a limited quantity available, the number of fishermen is excessive and their capital and operating costs are extremely high. The result is generally low incomes. In the past several years, several measures have been introduced to reduce fishermen's capital and operating costs and to limit entry into the Maritimes lobster fishery. First came limitations on number of traps that could be fished by an individual. There will be no increase in lobster trap limits for the 1969 season.

In 1967, in a number of districts, licenses were issued only to those fishermen who had held licenses in these districts in 1966. In 1968 this was extended to all the Maritimes. This new system of issuing licenses in 1969 only to those registered in 1968 is an effort to improve the economy of the lobster fishery. In the future, licenses will be issued to new boats only if they replace old boats whose licenses will be canceled.

The effectiveness of placing an upper limit on the size of the fleet harvesting the lobster crop will continue to be studied to determine if further measures are required, for example, reducing the number of boats. This

could be done by having the Federal government buy licensed lobster boats when they are offered for sale.

Registration Fees

Registration fees for lobster fishing boats are being increased from C\$3 to \$5. Each boat operator must have a \$2 personal lobster fishing license; helpers on the boat will neither require a license nor pay any fee. There are about 10,000 lobster fishing vessels and 23,000 lobster fishermen in the Maritime Provinces. The annual landed value of lobsters in the region is about C\$25,000,000. (Canadian Dept. of Fisheries, Jan. 20, 1969.)

TO ESTABLISH FRESHWATER FISH MARKETING CORPORATION

Canada soon should have a new Freshwater Fish Marketing Corporation to market fish, to increase returns to fishermen, and to promote international markets. Final passage of a Bill creating such an agency was expected early in 1969. Canada's freshwater catch is about 120 million pounds; about half is exported, almost entirely to the U.S.

Corporation's Powers

The Corporation will have the power to enforce minimum prices and other conditions of sale on exports, and to set minimum quality standards. The Bill empowers the Corporation to: (1) buy fish and prepare it for market, (2) buy, manufacture, or produce fish products or byproducts for market, (3) store, ship, insure, import, export, market, or otherwise dispose of all fishery products in its possession, (4) purchase, lease, or otherwise acquire real property, (5) establish branches throughout Canada, (6) invest in securities issued or guaranteed by the Canadian Government, (7) borrow money from any bank upon credit of Corporation, and (8) make loans of working capital, on a seasonal basis, to persons fishing for commercial purposes in a participating province. A participating province is one which has entered into an agreement with the Federal government to share

Canada (Contd.):

in the expenses of establishing the Corporation and to assist in its operation. The new agency will be headquartered in Winnipeg. (U.S. Embassy, Ottawa, Jan. 7, 1969, and Bill C-148.)

NO. 2 SEAFOOD FIRM ISSUES 1968 ANNUAL REPORT

The 1968 annual report of National Sea Products Ltd., headquarters in Halifax, shows considerable improvement over 1967. The firm is generally considered Canada's second largest seafood producer, after British Columbia Packers.

Operating profit in 1968 was C\$968,656, compared to a loss of C\$73,413 in 1967 and a profit of C\$2,158,152 in 1966. Nevertheless, the report notes, "The year's results, while better than 1967, cannot be considered satisfactory." Expenses showed a climb of 10 percent over 1967.

"United States market prices for ground-fish fillets and blocks, particularly cod and perch, were below the cost of production during the year and there are few signs of these prices strengthening in the immediate future."

Shellfish Marketed Aggressively

"Our improved results over last year largely came about by more aggressive marketing of shellfish, specialty items, and by-products. We shall continue to put increased emphasis on these lines as well as the development of new products, both in Canada and the United States."

Trawlers Built

In 1968, the program to add new trawlers was completed. Slightly over C\$3 million was spent for this purpose during 1968. There are no plans for more vessel building. The company is facing a shortage of experienced trawler captains and fishing crews.

Company experience suggests that Atlantic queen crab production is more efficient with smaller boats than with converted trawlers. (U.S. Consul, Halifax, Jan. 6, 1969.)

BRITISH COLUMBIA FISHERMEN LAND RECORD SALMON CATCH

Commercial salmon fishermen in British Columbia landed a record 180 million pounds in 1968, about C\$44.5 million ex-vessel--C\$6 million more than in 1966, the previous high. The total value of all fish landed in British Columbia in 1968 was C\$56 million--nearly C\$7 million more than 1967, but 9% less than 1966.

Value by Types of Vessels

All salmon fishermen enjoyed good catches. Returns to the gill-net fleet were particularly high. Landings by salmon gill-netters were valued at C\$20 million, 40% higher than the previous record in 1958. The value of salmon reported by salmon seiners, nearly C\$13 million, was C\$3½ million higher than in 1967, but second to C\$15.6 million received in 1958. Landings by trollers were valued at about C\$12 million, slightly above 1967 but down from the 1966 record of C\$13.9 million.

Salmon Species

Sockeye salmon were the most important in value in 1968--41 million pounds worth C\$15½ million ex-vessel. Coho landings of 29 million pounds were worth C\$10½ million. Pink--54 million pounds--had a landed value of C\$6.8 million. Spring salmon landings were more than 13 million pounds, worth close to C\$7 million. Chum salmon increased to 36 million pounds, the highest since 1958, worth nearly C\$5 million.

Halibut and Herring

Halibut landings--28 million pounds valued at C\$7.1 million--were up about 10% from 1967. Ex-vessel prices averaged around 25 cents a pound, unchanged from 1967. Due to the low level of herring stocks, the reduction fishery was closed in 1968. Production, limited to bait and experimental fishing, had a value of only C\$160,000. Normally landings are worth between C\$4 and 6½ million. Landings of grey and ling cod, sole, and other groundfish, valued at C\$1.8 million, were up 10% over 1967. Landings of most species of shellfish were down from 1967, although the shrimp catch rose slightly. Wholesale value of 1968's catch was expected to exceed C\$110 million. ("Fisheries News," Canadian Dept. of Fisheries, Dec. 30, 1968.)

EUROPE

Denmark

CONCERN OVER EUROPEAN COMMON FISHERIES POLICY EASED

A Danish delegation met with representatives of the European Communities' Commission (EC), the new name of the European Economic Community (EEC), during mid-Dec. 1968 to seek reconsideration of the proposed Common Fisheries Policy. This provides for licensing of fresh fish imports and requires surety deposits. More than three-fourths of Danish annual exports to the European Communities (US\$46.7 million) is fresh fish.

Danish Fear

Denmark feared the proposed requirement that importers post a surety bond to obtain import licenses would obstruct free trade. The Danes hoped to obtain clarification of the import provisions. The EC representatives promised that those provisions would be significantly eased in the final proposal; also; in practice, the provisions would be flexibly enforced to avoid hampering trade with non-member countries. Indications were given that "import certificates" would continue to be required for fresh fish--but the surety bond provision would be liberalized.

Export Price System

The "reference price" import-control system was also discussed. The EC representatives commented favorably on the new Danish minimum export price system on herring. They called it a "good adjustment" to the Common Market system.

Denmark is the major nonmember supplier of fish to the Common Market countries. As a group, the six countries constitute Denmark's best customer for fish and fish products. So Denmark has a major interest in the proposals for the EC Common Fisheries Policy. (U.S. Embassy, Copenhagen, Dec. 30, 1968.)

FAROESE EXPORTS OF FISHERY PRODUCTS DECLINED IN 1968

In 1968, Faroese fishery products exports totaled \$12.1 million, compared with \$14.1 million in 1967. Salt fish exports to Spain and Italy, primary Faroese salt fish markets, declined. The declines were caused by overproduction in a number of salt fish producing countries. The Faroese exported only 8,200 tons of salt fish to Italy in 1968, compared with 13,500 tons in 1967. Salt-fish exports to Spain amounted to 7,200 tons in 1968, 8,400 tons in 1967. However, Greece took 3,000 tons in 1968--2,000 tons more than in 1967. Faroese salt-fish production was 27,000 tons in 1968, and 30,000 tons in 1967.

Poor Fishing in 1967-68

In 1968, lower prices on world markets for major Faroese fishery products also contributed to the lower total value. A large part of the fishing fleet is in financial difficulty, because of increasing costs of operation and poor fishing during the last 2 years. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

FAROESE FISHERMEN MAY STRIKE

Conflict between fishermen and vessel owners on the Faroe Islands has idled 80% of the fleet. Negotiations, broken off in December 1968, were resumed on January 17, 1969. A strike has not been formally declared but is considered imminent. A total strike would include North Sea herring vessels and freezer vessels now docked in British harbors, as yet not involved. The conflict concerns fishermen's demands for higher minimum wages, price supports, and a greater share of the catch.

Legislature Seeking Solution

The Faroese legislature, called into session on Jan. 8 to consider the case, has not yet solved it, probably because the two controlling political parties have not agreed on a solution. However, informed sources say that settlement may be expected shortly. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

Denmark (Contd.):

ADVERTISES FOR
NORWEGIAN FISHERMEN

The fishermen's association of Esbjerg, Denmark, has sent bulletins to a number of places in north Norway urging qualified unemployed fishermen to come to Denmark for work on Danish cutters fishing the North Sea. Esbjerg alone needs 100 crewmen and would welcome them. The Norwegians would have the same social rights and privileges as Danish citizens.

N. Norway Fishing Poor

Fishing has been extremely poor in northern Norway during the past year. Many residents there are having severe economic problems. The Esbjerg association has received the first inquiry and more are expected. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)



USSR

RESEARCH CONDUCTED ON
PACIFIC OCEAN PERCH

During the past few years, scientists of the Soviet Pacific Scientific Research Institute for Fisheries and Oceanography (TINRO) have conducted extensive and systematic studies of fishery stocks of the Pacific Northwest and California. In November 1968, some preliminary results of studies on northeast Pacific oceanperch were published in "Rybnoe Khoziaistvo," the Soviet Ministry of Fisheries periodical.

The author, TINRO scientist V.A. Snytko, reports that Pacific oceanperch (*Sebastes alutus*) occurs between 48° and 51° N., off Vancouver Island, and between 43° and 46° N. In the Vancouver-Oregon area, the densest concentrations occur in summer and autumn, between 150 and 300 meters. With decreasing water temperature, the fish migrate to greater depths, wintering in small dense schools in canyons and troughs, where they are less accessible to fishing.

Fish Sizes

Pacific perch caught in the area are from 15 to 54 cm. long, weigh from 55 grams to 2 kg., and are 3 to 26 or more years old.

Catches are mostly fish from 31 to 43 cm. long and from 10 to 14 years old. The perch in the Eastern Pacific are larger than in the Bering Sea or the Gulf of Alaska.

Perch Stocks Biology

In the Vancouver-Oregon area, the biology of perch stocks is similar in many respects to their biology in other areas. Growth is fast during the first 2-3 years of life, then slows. After the 13th year, annual growth rate is less than 1 cm. Mass hatching of larvae in the Vancouver-Oregon area occurs in February-March at 250-400 meters, with water temperatures of 6-8° C. In the Bering Sea and the Gulf of Alaska, the hatching occurs in March-April and April-May, respectively.

Migration

Feeding migration in the Vancouver-Oregon area lasts from spring to late autumn, when daily vertical migrations are clearly marked, except on cloudy days and during new moon. Perch migrate an average of 30-40 miles, depending on the steepness of the continental slope.

* * *

RESEARCH VESSEL BEGINS 44th CRUISE

In late Nov. 1968, the 'Vitiaz,' oceanographic research vessel of the Soviet Academy of Sciences, left Vladivostok on her 44th scientific cruise. She was scheduled to spend 3½ months in the tropical Pacific, visiting the Coral Sea, the Solomon Islands, the Gilbert Islands, New Caledonia, and New Hebrides. Her first scientific station was at Tarawa Atoll in the Gilberts. In early January 1969, the Vitiaz called at Noumea, New Caledonia, after conducting research on the biological productivity of the ocean. From there, she was to go to Malekula Island in the New Hebrides, to the Coral Sea, and then to Australia's Great Barrier Reef.

Purpose of Voyage

The principal purpose is to find methods to increase productivity of the oceans. Soviet scientists believe the world's annual maximum sustainable yield for marine fisheries can reach 100 million metric tons. Total world marine catch was 50.6 million tons in 1966 and 53.9 million in 1967.

USSR (Contd.):

The Soviet scientists will perform biological research and gather data necessary to design a mathematical model for the fishery resources in the Pacific's upper layers.

Scientific Personnel

The expedition is headed by M. E. Vinogradov, Deputy Director of the Oceanology Institute of the Soviet Academy of Sciences. Sixty scientists from Soviet marine research institutes are participating.

In mid-May 1968, Vitiaz returned from a 4-month scientific cruise, her 43rd, covering most of the Central Pacific.

* * *

AIRLIFT FUR SEALS FROM
SAKHALIN TO BATUMI

In August 1967, 6 Kamchatka fur seals, caught on Tyulenii Island, off Sakhalin, were transported by tug, truck, and aircraft to an aquarium at Batumi on the Black Sea. The seals, both male and female, were 2 years old or less.

Methods of Transport

They were carried in 110x65x65 cm. wooden cages weighing 41 kilograms (kg.) including the 10-kg. drip pan. From Tyulenii, the seals were brought by tug to Sakhalin Island, and washed in sea water with about 200 kg. of ice packed around the cages. The seals were trucked to Yuzhno-Sakhalinsk airport, loaded on an IL-18 aircraft and flown to Adler on the Black Sea. In Adler, they were transferred to another aircraft for the flight to Batumi.

Washed Again

Stopovers were made in Khabarovsk on the shore of the Sea of Okhotsk and Novosibirsk. In Khabarovsk they were washed again, this time with fresh water. Then 200 kg. of ice again were packed around the cages, but only along the sides because the seals appeared to be cold when ice also covered the tops. Air temperature was kept at 10-24° C. during the flight. The seals slept the entire time, both aloft and on the ground during stopovers.

Life at Batumi

At Batumi the animals were placed in 70-cubic-meter capacity oval tanks filled with water from the Black Sea. The seals, now permanent house guests at the aquarium, are very popular with visitors. ('Rybnoe Khozaiatvo,' Nov. 1968.)

* * *

PRODUCES FULL-LENGTH
FILM ON OCEANS

A Soviet documentary and scientific film studio has begun shooting a full-length color film titled 'Planet Ocean' ('Planeta Okean'). It will be a combination fiction-documentary depicting problems met in studying and exploiting deep-sea resources. Filming began in summer 1968 in the Black Sea off Sevastopol and will continue in the Far East off Kamchatka and the Kurils. ('Sovetskaya Rossiya,' Dec. 28, 1968.)

* * *

DEVELOPS NEW FISH-PROCESSING
EQUIPMENT FOR USE AT SEA

The Soviet fishing industry has developed 4 new fish-processing plants to be used aboard BMRT-class large factory stern trawlers. The plants include head-cutting, scaling, filleting, and fillet-pressing machines. Three of the plants were tested successfully aboard the BMRTs 'Sapfir' and 'Kol'tsov,' in the central and southwestern Atlantic. With the new plants, up to 15 men per vessel can be shifted to other duties, saving about 38,000 rubles (US\$42,180) in operation costs per vessel annually.

Fillet-Pressing Machine

The fourth plant is a fillet-pressing machine. It removes air and moisture from fish fillets, compressing them into small compact blocks. As a result, 15% more blocks can be stored in stern factory trawler holds, freezing time of smaller fillet blocks can be reduced by 20%, and consumption of packaging materials by 10%.

Fish-Meal Grinding Plant

The Far Eastern Fisheries Administration has tested a mechanized fish-meal grinding

USSR (Contd.):

plant that grinds coarse fish meal into a finished product. The first operational tests successfully produced 85 tons of finely ground fish meal. The equipment now will be installed aboard Far Eastern BMRTs. ('Rybnoe Khoziaistvo,' No. 9, 1968.)



East Germany

SHIPYARDS CAN BUILD 5,000 TONS OF FISHING VESSELS A MONTH

Total capacity of East German shipyards for fishing vessel construction is in excess of 5,000 gross tons a month. Three East German shipyards built 14 fishing vessels totaling 15,650 gross tons during Jan.-Mar. 1968. Most of them went to the Soviet Union, including 5 'Atlantik' class vessels, 2,650 gross tons each. Only 1 trawler, 1,000 gross tons, was delivered to the East German fishing industry. Six small cutters, about 200 gross tons each, were built for Denmark and Sweden.

* * *

TO TEST FIRST UNDERWATER LAB

East Germany's first undersea 'laboratory' is being readied for submersion in the freshwater reservoir near Dippoldiswalde. Designed and built by amateurs, it is a steel cylinder 4.2 meters (13.8 feet) long, 1.8 meters (5.9 feet) in diameter, and weighs 14 metric tons. Two divers will be lowered to 10 meters (32.8 feet) for 2 days in the first experiment. Air and oxygen will be supplied from shore.

Poles Experiment Too

The announcement of this modest experiment follows by only a few weeks a similar, more advanced, experiment in Poland. The Polish news media gave it wide coverage. In the Polish experiment, 3 aquanauts spent 7 days at 24 meters (78.7 feet) in the Baltic.



Iceland

PERMITS TRAWLING WITHIN FISHERY LIMITS

The Icelandic Parliament passed a law on Dec. 19, 1968, permitting Icelandic fishing boats up to 200 GRT to trawl in certain areas north and south of Iceland during Jan. 1-Apr. 30, 1969. This action was taken while awaiting recommendations of a parliament-appointed committee for more permanent legislation expected in late January or early February 1969.

Besides temporary exceptions provided by Icelandic-U.K. agreement 10 years ago, this is the first trawling to be permitted since establishment of the fishery limits in 1958. Ichthyologists believe such operations are possible without any serious damage to sea resources. Nevertheless, relaxation of the prohibition against trawling within the limits has been long in coming because of strong public emotions.

Government's Case

The Government is aware of international sensitivity about fishery limits. It claims that the new law is a direct continuation of one of Iceland's main arguments for extending the limits--that Iceland wishes to use the fishing grounds within the limits for its optimum economic advantage, and that the fisheries will be restricted and conducted under scientific control.

There has been widespread approval of the law. However, small hand-line fishermen have registered some apprehension that their fishing grounds might be destroyed. The owners of larger trawlers than 200 GRT have expressed a desire to be allowed also to operate within the limits. (U.S. Embassy, Reykjavik, Jan. 2, 1969.)



Sweden

RADIOTELEPHONE FISHING ANNOUNCEMENTS MAY BE CODED

Fishermen of Sweden's Baltic coast are considering either coding their radiotelephone announcements about good fishing or stopping them completely. Nearly every time

Sweden (Contd.):

they locate good fishing and radio their colleagues, vessels from Poland, East Germany, and the USSR soon appear and virtually fish out the schools in the area. The Swedes suspect that the other countries maintain a receiver especially for these transmissions. One trawler skipper said that announcements of good fishing at certain locations quickly produce a "forest of masts on the horizon." (U.S. Embassy, Copenhagen, Jan. 21, 1969.)



Spain

ATTEMPTS TO CONCENTRATE FISH-PACKING INDUSTRY

Spain is trying to spur concentration of the fish-packing industry. An official decree of Dec. 1968 offers preference in obtaining official credit to build new consolidated fish-packing plants meeting specified technical standards. The decree includes the benefits the government already has offered for general industrial consolidation. The government was to accept construction applications under the decree for 3 months.

Concentration of enterprises in this industry may generate an increased demand for larger and more modern packing machinery. So the decree should interest U.S. food-packing equipment exporters.

Concentration to Help Exports

The present fish-packing industry is about 500 small firms. This lack of centralized organization, as in other parts of the food-packing industry, often results in poor quality control and a lack of standardization, weakening export marketing efforts. Despite these weaknesses, Spain exported about US\$10 million worth of canned fish in the first eight months of 1968. The Ministry of Industry expects that a concentration of firms will increase this already-high export volume. (U.S. Embassy, Madrid, Jan. 21, 1969.)



France

NEW TUNA SEINER MAY FISH YELLOWFIN IN EASTERN PACIFIC

France may join the nations fishing yellowfin tuna in the eastern tropical Pacific when the 176-foot seiner 'Biscaya,' launched in fall 1968, is commissioned in Bayonne, France.

U.S. tuna fishermen may know her sisterships: the 'City of Tacoma,' the 'Blue Pacific,' and 'Jeanette C.'

When completed, the French vessel, manned by French Basques, probably will fish in the Atlantic and Pacific. She will deliver her catches to the cold-storage plant and canneries in Saint Jean de Luz.

Experienced Owners

The Biscaya's owners are experienced in the tuna fishing industry of France. Their firm, Luz Armement, also owns 2 other tuna purse seiners, both built on French designs.

Skippers of the Biscaya and the other 2 vessels spent time on U.S. tuna purse seiners learning fishing methods.

Biscaya has an 800-ton capacity and should be as efficient as her sisterships from Tacoma, Wash.

France Not IATTC Member

France is not a member of the Inter-American Tropical Tuna Commission and will not be bound by the yellowfin quota in the Eastern Tropical Pacific. Yugoslavia, Japan, and possibly Cuba are other non-IATTC members fishing in that area. ('National Fishermen,' Jan. 1969, and other sources.)

CRISES IN COD FISHERIES

Trawler fleet fishermen are threatening a partial production strike unless the government aids them. The fleet, operating on the banks off Newfoundland, has an annual cod production of 56,000 tons; 20,000 tons of that are exported. Production, salted or frozen, is valued at US\$30 million.

France (Contd.):

Skippers now are threatening to make only one trip to the banks this year instead of the customary three. Each trip lasts 3 months. The skippers say they can no longer compete with Spanish, Icelandic, and British operations because those countries devalued their currencies. As a result, cod prices have dropped from about \$0.13 to \$0.12 a pound for salted cod, and from \$0.19 to \$0.17 for frozen cod.

Need Modern Vessels

The real difficulty is that only 9 of the fleet's 31 trawlers are capable of freezing fish on the grounds. Vessel owners hope for government help through next season. This would give them time to negotiate with the Common Market's Agricultural Fund. They hope the fund will partially finance the purchase of 9 new trawlers if they agree not to demand a certain share of sales within the Common Market. The skippers claim to have an agreement in principal for support of this type so they can obtain new equipment before 1974. ('Vestkysten,' Dec. 4, 1968.)



OECD Issues Review of 1967 Fisheries

Various fishery developments in the North Atlantic, North Pacific, and Mediterranean are examined in a "Review of Fisheries in OECD Member Countries in 1967," published in early Dec. 1968. The Review was asked by the organization's Committee for Fisheries, whose members represent countries producing about half the world's fish supply and handling around 70% of the international trade in fish and fish products.

Although overall fish catch in northern waters was heavier in 1967 than in 1966, supplies for direct human consumption were lower. The more plentiful species were those used mainly in fish meal and oil manufacture. Cod catch in North Atlantic areas, the mainstay of a number of major fisheries in bordering nations, was smaller.

Mixed Picture

This supply situation and a widespread marketing recession for bulk fish resulted in lower returns to most fishing fleets. Coastal fisheries, producing a greater variety of

high-quality fish for sale fresh in nearby markets, enjoyed reasonably good yields and fared better, on the whole.

The Review gives special attention to international outlets for products from the reduction industry (meal and oil) and cod fisheries (frozen and cured). In those markets, OECD countries are among the leading producers--Scandinavian countries, Canada, Japan--and consumers--U.S. and U.K.

Reduction Industry

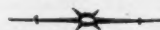
As production of raw material for the reduction industry was at an all-time high, sales could only be effected at greatly reduced prices. This caused generally lower returns to fishermen and vessel owners; in a number of cases, operational stoppages. Certain fisheries with poor yields, such as Iceland's herring fisheries and the U.S. menhaden fisheries, were hit particularly hard.

Prices also were depressed in the North-East and North-West cod fisheries. These are important, not only to countries near the fishing grounds--Canada, Greenland, Iceland, Faroes, Norway--but also to all European distant-water fleets. The decline might have started with overstocking of blocks of frozen fillets for the U.S. fish stick and portion industry, subsequently spreading to other markets across the Atlantic. The frozen-fish market is being examined by the Committee.

More Government Aid

The fisheries of many nations suffered setbacks, often with serious consequences. This was true especially for Iceland, whose economy depends so heavily on fish exports. The adverse conditions stimulated national authorities to increase financial aid to their fishing industries. The Review concludes that "this could have adverse effects by distorting the normal conditions of the increasing competition between fishing countries."

Countries covered in the Review are: Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Turkey, the U.K., and the U.S. The publication is available from: OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave. NW., Washington, D.C. 20006, at \$2.30. (OECD Press Release, Dec. 2, 1968.)



LATIN AMERICA

Peru

1968 WAS BANNER YEAR FOR FISH MEAL PRODUCTION AND EXPORTS

The year 1968 set a record for Peruvian fish meal production and exports. (The season lasts from fall to spring, so any summary of a calendar year overlaps parts of two seasons.)

From Jan.-Dec. 1968, production totaled 1,921,900 metric tons; in 1967 it was 1,815,983.

Exports during 1968 reached 2,083,205 metric tons; in 1967, 1,560,900.

Partly due to lack of fish, fish meal production dropped significantly in November. December production was lowest in 1968, except during closed season. Fishing during the first two weeks of December was concentrated around Chimbote, although fishing farther south picked up during the third week.

Closed Season Set

On Jan. 9, 1969, the Government announced a closed season (veda) during Feb. 1-Mar. 2, and a provisional limit on the 1968-69 anchoveta catch of 8.2 million metric tons. Fishing during the veda may continue out of Ilo in southern Peru. (Sociedad Nacional de Pesqueria.)

1968 FISH MEAL EXPORTS

Peru exported 2,083,205 metric tons of fish meal in calendar year 1968; more than half went to only 3 countries: The U.S. was the largest single buyer with 550,413 tons. West Germany was second with 396,853 tons, followed by the Netherlands with 201,482.

7 Countries Took More Than 40,000 Tons Each

Spain imported 110,979 tons and Italy 102,420. Japan ranked sixth with 97,578 tons, Mexico took 84,909, and East Germany placed 8th with 81,005. Poland imported 68,866 tons, Yugoslavia 52,965, and Czechoslovakia 43,680.

Countries Importing Less Than 35,000 Tons

Venezuela, the U.K., and Belgium each imported more than 30,000 but less than 35,000 tons. Hungary, France, and the Philippines each took a little over 20,000 tons. Sweden and Singapore each imported over 15,000 tons, while Ireland, Taiwan, Finland, and South Korea took slightly more than 10,000 each.

Countries Importing Less Than 10,000 Tons

Argentina, Bulgaria, Brazil, Colombia, Israel, and Greece each imported less than 10,000 but more than 5,000 tons; El Salvador trailed with 2,408. All other importing countries combined took only 5,504 tons.



Brazil

FISHING INDUSTRY OUTLOOK

Brazil, potentially an important supplier of shrimp to the U.S., is offering very attractive incentives for fishing industry investments through 1972. Export industries provide the best opportunities for immediate returns.

Large untagged shrimp resources in both the north and south only now are beginning to be exploited by firms financed by U.S. and other foreign capital. Two new U.S.-financed firms, operating from Belem at the mouth of the Amazon, together plan to export to the U.S. over 4 million pounds of shrimp annually, or more than 3.5 times the total U.S. imports of Brazilian shrimp in 1968. Brazil's shrimp exports to the U.S. increased sharply in 1968, to a level almost 7 times that of 1967.

The Brazilian Government is expected to examine new investment projects with a more critical eye than previously. Projects generating export earnings should be favorably received.

Although vast improvements are needed to improve fish distribution in Brazil, investments, plus U.S. technology and management, might overcome some of the problems. Opportunities also exist for the sale of U.S. equipment that can solve or circumvent problems in the production-marketing chain.

Brazil (Contd.):

Legal Problem for American Firms

American firms with fisheries investments in Brazil, involved in a legal problem concerning interpretation of regulations on vessel registration, reportedly have not encountered unusual bureaucratic hurdles in other operations.

Catches of shrimp and catfish for export are increasing; the spiny lobster catch, almost all exported to the U.S., is levelling off after several years of sharp decline.

Brazilian Laws

The new Brazilian fishery development law is having an important impact. The Fisheries Ministry had approved projects totaling US\$40 million through August 1968.

Brazilian law provides a tax rebate of US\$0.10 a gallon on diesel fuel (current cost US\$0.25 per gallon) used to produce goods for export. An agency to administer the program is expected to be established soon.

Areas of Development

- Several Brazilian organizations are planning to produce FPC.

- At least four institutions are training personnel for the fishing and fish processing industries, assuring a supply of trained labor.

Marketing Problems

- While the bulk of approved investment programs have concerned fish catching, marketing needs the greatest improvement. Currently, all fish has to be transported by truck, distribution facilities are antiquated, and fish sold in normal food channels costs more than meat.

Note: More details are available in Foreign Fisheries Leaflet 173, "Fishing Industry Outlook--Brazil," available on request from Joseph Pileggi, Chief, Branch of Foreign Fisheries, Department of the Interior, Room 8015, Washington, D. C. 20240.



Mexico

TO BUILD SALINA CRUZ FISHERY COMPLEX

A \$12 million fisheries complex is to be built at Salina Cruz, Oaxaca, far south of Mexico's Pacific coast. Complete details are not available, but the installation is to handle 20,000 metric tons of tuna and bonito annually, and can approximately 6,600 tons. Twenty-five percent is to be marketed domestically, the rest exported.

French Financing

The project will be financed from a US\$35 million loan made subsequent to the French-Mexican protocol of 1967. French interests will pay 95%, Mexicans the rest. (U.S. Embassy, Mexico, Jan. 18, 1969.)



Trinidad and Tobago

PLANS FISHING COMPLEX

A multimillion-dollar fishing industry complex, including Caribbean Free Trade Association (CARIFTA) territories, is planned in Trinidad and Tobago's next Five-Year Development Program (1969-1974). The proposal is based, in principle, on recent OAS fishery development survey.

CARIFTA members are Antigua, Barbados, Guyana, Trinidad and Tobago, Dominica, Grenada, St. Kitts-Nevis-Anguilla, St. Lucia, St. Vincent, Jamaica, and Monserrat. British Honduras has applied for membership.

WHAT IS PLANNED

The US\$7.1 million fisheries scheme calls for the purchase, installation, and operation of the entire project by a single company. The company would be responsible for:

- 1) A fleet of seiners and trawlers;
- 2) Support vessels to transfer catch and furnish ice, fuel, food, and all other requirements from fishing port to fishing grounds;
- 3) A special fishing harbor with cold-storages and facilities for manufacturing ice and dry ice;

Trinidad & Tobago (Contd.):

4) A maintenance shop for engines and fishing gear and a small shipyard for the fishing fleet;

5) A small factory to make and repair fishing nets;

6) A store for spare parts and fuel oil bunkers for local and visiting ships;

7) Processing facilities for canning, filleting, smoking, salting, and dehydrating fish; and for producing fish meal and fish protein concentrate;

8) Distribution centers in Trinidad and Tobago, and in other CARIFTA area territories, to market fresh, chilled, and frozen fish, emphasizing safe and sanitary distribution.

UN Help

United Nations Special Fund has set aside US\$1.5 million to provide technical assistance for implementation of the project, and supervision during the first operational period.

Plans to build a modern fishing port are included. Sea Lots, Point Lisas, and Chaguanas are possible sites. A fisheries training school is to be established at the University of the West Indies to provide technological training.

It is not clear whether the government will run the proposed scheme entirely on its own initiative or invite local entrepreneurs to participate. Nevertheless, it is clear that Trinidad & Tobago has finally realized the importance of implementing and developing one of the country's richest and most viable economic assets. (U.S. Embassy, Port of Spain, Trinidad, Dec. 17, 1968.)



Guyana

FIRE RAZES OFFICES, DOCKS OF GEORGETOWN SEAFOODS

In Georgetown, Guyana, the downtown offices and docks of the U.S. shrimp trawler firm Georgetown Seafoods were razed by fire Jan. 1, 1969. The 15 trawlers berthed at the docks were removed to safety. Major installations of the company, several miles upriver from Georgetown, were not involved. (U.S. Embassy, Georgetown, Jan. 2, 1969.)



HOW MANY SPECIES OF FISHES ARE THERE?

Although fishes are the most numerous of the recent vertebrates, there is little agreement among scientists on the number of species. Estimates range from 15,000 to 40,000 species; however, 25,000 appears to be the most often quoted figure. This discrepancy exists because fish species are sometimes named more than once due to inadequate descriptions and variation due to environment or geographical distribution. In some fish species, the male has been described as belonging to one species and the female to another because of a difference in body form or color pattern. This phenomenon is called sexual dimorphism. Other fishes have been named more than once because the young look different than the adults. In addition, most scientists agree that not all fishes have yet been named; the estimate of 25,000 allows for this unknown. The species of fishes with bony skeletons are more numerous than those with skeletons of cartilage (sharks and rays). Bony fish number around 20,000 while the cartilaginous fish number only about 600. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ASIA

Japan

FISHERIES BUDGET INCREASES IN FY 1969

The Japanese cabinet adopted the fiscal year 1969 (April 1969-March 1970) budget estimates for submission to the Diet (parliament). Estimates for the Fisheries Agency total about US\$94.14 million, an increase of 16% over FY 1968 budget of \$78.97 million.

The FY 1969 budget carries large increases for guidance and patrol in the coastal and high-seas fisheries, vessel construction, biological research for international fisheries, fishing industry disaster compensation, overseas fishery development, and fishing-port improvement projects. Funds newly authorized include \$83,000 subsidization of private fishery surveys to promote the distant-water fisheries, and \$53,000 for saury resource surveys off Japan. ('Nihon Suisan Shimbun,' Jan. 15, 1969.)

LONG-TERM OUTLOOK FOR MARINE PRODUCTS

The Japanese Fisheries Agency has released an interim report on the long-term outlook for demand and supply of marine products in Japan. The report, using 1966 as the base year, predicts Japan's demand for fishery products in 1977 will exceed 11.5 million metric tons, compared with 8.07 tons available in 1966. Domestic production is expected to increase to around 8.9 million tons in 1977, from 7.32 million tons (including whales) in 1966. Therefore, there is likely to be a supply shortage of over 2.6 million tons by 1977.

Increases in Imports and Production

Opinions among Japanese scientists and businessmen vary as to whether this deficiency can be met through imports or through increases in domestic production. The question concerning imports is whether the developing fish-exporting countries will be able to supply the deficiency--because, even in those countries, fish consumption is likely to increase with a rise in income. There also is a growing shortage of animal protein in many countries. As for increasing fish production

in Japan, the problem is to solve the supply shortage, particularly of higher-valued fish and shellfish. The demand for these will continue to increase as income rises and diet improves.

Other Solutions Proposed

Some proposed solutions are: (1) promotion of fish breeding and cultivation, (2) development of coastal fisheries, (3) utilization of untapped bottomfish and other fishery resources, and (4) improvement of fishing and processing techniques. However, even implementing these proposals probably would not increase production by more than 1-2 million tons. Therefore, the demands created by rising income and population growth still can be expected to outstrip supply. ('Minato Shimbun' and 'Suisan Tsushin,' Dec. 1968.)

ALLOCATES NORTH PACIFIC WHALE QUOTA

On Dec. 26, 1968, the Japanese Fisheries Agency announced domestic allocation of the North Pacific baleen whale catch quota allotted to Japan for the 1969 season--886.5 blue-whale units (BWU). The quota was divided among 3 participating whaling firms: Taiyo and Nihon Suisan, 285.5 BWUs each; Kyokuyo Hoge, 315.5 BWUs.

Japan's Quota Cut

Catch limit on North Pacific baleen whales, set by the International Whaling Commission in June 1968, cut Japan's 1969 share by 114.5 BWUs from the 1,001 units authorized during the preceding 4 years. ('Suisan Tsushin,' Dec. 28, 1968.)

INVESTMENTS IN OVERSEAS FISHERIES

In Oct. 1968, there were Japanese capital investments in 38 overseas joint fisheries ventures. Thirty were active, 6 were temporarily inactive, and 2 had discontinued operations. Only 10 were making profits; the rest were losing money. The 10 distributing profits to shareholders in 1968 were:

Japan (Contd.):

	Date Established	Total Capital	Japanese Co.	Japan's Share	Business
		US\$		%	
Australia (Papua)	June 1967	111,110	Kinkai Hoge	49	Shrimp trawling
Canada	July 1967	92,500	Taiyo Gyogyo	49.5	Whaling
Fiji Islands	Aug. 1964	756,670	Nichiryō	90	Cold storage
			Banno Tsusho		
Hong Kong	May 1955	522,810	Nihon Suisan	3.3	Cold storage
India	April 1956	266,670	Taiyo Gyogyo	49	Cold storage
Malaysia (Malaya)	Aug. 1959	163,330	Overseas Fishery Co.	49	Cold storage, tuna fishing & packing
Malaysia (Sabah)	May 1964	194,250	North Borneo Fishery Co.	48	Shrimp trawling
Mauritius Island	Feb. 1967	47,920	Overseas Fishery Co.	36	Bottom trawling
Netherlands Antilles	May 1963	284,400	Nippon Reizo	100	Cold storage
Thailand	July 1966	35,420	Kyokuyo Hoge & Nomura Boeki	66.6	Cold storage

Source: 'Suisan Tsushin,' Jan. 11, 1969.

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FROZEN TUNA EXPORTS
ROSE IN 1968

Frozen tuna exports to the United States (excluding American Samoa) and Canada during Jan.-Dec. 1968 totaled 75,959 short tons valued at US\$29,222,115--10,237 tons and \$1.1 million over 1967. Exports to Europe and other countries in 1968 totaled 30,693 metric tons worth US\$12,138,335, down 4,832 tons and \$3.3 million from 1967. ('Suisancho Nippo,' Jan. 20, 1969.)

(\$106 a ton in 1967) and resulted in an unprecedented bait shortage for tuna fishermen. Until 1963, Japanese saury landings averaged 400,000 tons a year, but during the following 4 years catches dropped to between 200,000 and 300,000 tons.

In view of the declining catch off Japan, the saury industry may seek new grounds in distant waters. ('Suisan Shuho,' Jan. 5, 1969.)

* * *

	Jan.-Dec. 1968		Jan.-Dec. 1967	
	Quantity	Value	Quantity	Value
	Short Tons	US\$	Short Tons	US\$
Exports to:				
United States & Canada ^{1/} :				
Direct exports from Japan	46,738	20,815,685	2/40,638	19,171,022
Atlantic and Indian Ocean Transshipments	29,221	8,406,430	25,084	8,921,644
Total	75,959	29,222,115	65,722	28,092,666
Europe and Other Countries:	Metric Tons		Metric Tons	
Italy	24,655	10,671,399	30,256	13,696,511
France	440	207,775	280	145,865
Spain	3,066	706,624	664	155,948
Ghana	1,766	250,610	831	107,799
Others	766	301,927	3,494	1,414,484
Total	30,693	12,138,335	35,525	15,520,607

^{1/}Excludes deliveries to American Samoa.^{2/}Exports to Canada totaled 1,593 short tons in 1967.

* * *

SAURY CATCH HIT RECORD
LOW IN 1968

The 1968 saury catch was 127,000 metric tons--over 80,000 tons less than the 215,000 tons in 1967. The sharp decline raised the season's average price to US\$129 a short ton

5 SEINERS LICENSED FOR EASTERN
PACIFIC TUNA FISHERY

On Jan. 13, 1969, the Japanese Fisheries Agency announced it would license 5 purse seiners to operate in the Eastern Pacific in 1969:

Japan (Contd.):

Name of Vessel	Size	Owner
	Gross Tons	
'Hakuryu Maru No. 55'	499.57	Kawajiri Gyogyo Fishing Co.
'Gempuku Maru No. 82'	499.66	Toyo Gyogyo Fishing Co.
'Hayabusa Maru No. 3'	275.34	Taiyo Fishing Co.
'Nissho Maru'	252.93	Kinkai Hoge Fishing Co.
'Taikai Maru No. 23'	210.20	Ogata Gyogyo Fishing Co.

Agency's Position

The Agency indicated that for some time the issuance of licenses will be limited to 5 vessels because unrestricted licensing would raise strong opposition from longline operators, and antagonize foreign countries. The Agency also intends to take steps for Japan's admission into the Inter-American Tropical Tuna Commission in 1970, since purse-seine fishing naturally will increase Japan's yellowfin landings in the regulatory area. Japanese longline catches in the area have been around 3,000 tons annually.

Fishing Plans

The 5 seiners were expected to depart Japan in late January 1969. After closure of the yellowfin fishery in the regulatory area, 'Hakuryu Maru' and 'Gempuku Maru' are scheduled to move to the eastern Atlantic. The other 3 seiners either will fish in the southwest Pacific, or enter the seine fishery off Japan. ('Suisan Tsushin,' Jan. 16, 1969.)

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FISHING FIRMS EXPLORE
OFF U.S. EAST COAST

In 1967, Japanese fishing firms began investigating bottomfish resources in the western Atlantic to find alternate fishing grounds for the slow season off west Africa.

In Jan. 1969, the stern trawler 'Sekishu Maru' (997 gross tons), owned by a Nichiro-affiliated firm, fished off Florida. She took over 20 tons per operation, mostly butterfish. Another stern trawler, 'Kaimon Maru' (2,500 gross tons), owned by Nihon Suisan, was scheduled to begin fishing in late January.

Off Nova Scotia

The 2,500-ton stern trawler 'Shirane Maru' is off Nova Scotia on a government-subsidized resource survey cruise. Catches are averaging 10 tons of processed fish a day--60% deep-sea smelt and 40% rockfish, dressed and frozen aboard the vessel. 'Shirane Maru' is scheduled to continue operations until March 1969, then return to her

base at Las Palmas, Canary Islands. ('Minato Shimbun,' Jan. 7 & 12, 1969.)



Singapore

NEW FISHERIES LAW TAKES EFFECT

Singapore's Fisheries Act, first introduced in 1966, became effective Jan. 1, 1969. It provides for control of inshore and inland fisheries, fishing harbors, and licensing of fishermen and allied workers. It also regulates fishing methods and gear, fish-processing industries, and provides for fish conservation and culture. The Act does not cover either coastal or deep-sea fishing.

Base for Foreign Fishing Vessels

Singapore's importance as a base for foreign fishing vessels has been growing steadily. Soviet fleets fishing in the Indian Ocean and whaling in Antarctic waters take on fuel, water, and other supplies at the port.

Building New Fishing Harbor

Construction of the large fishery complex at Jurong is lagging, but work is continuing and plans for the new fishing harbor should be made public soon. Singapore also plans to establish an FAO southeast Asia fisheries training center, and to reopen the former British fishery research station at Changi. (U.S. Embassy, Singapore, Jan. 10, 1969; Oct. 11, 1968.)



Taiwan

'KURUMA' SHRIMP IS
CULTIVATED SUCCESSFULLY

The government's fisheries research station at Taiwan has succeeded in artificially breeding 'kuruma' shrimp. About 50,000 larvae were raised in the hatchery for about 20 days, then transferred to the nursery, and released in the ponds. This experiment was the first of its kind in Taiwan.

Because it was successful, the government intended to build a shrimp hatchery in Pingtung Province by the end of 1968, and planned to rear artificially about 50,000 larvae per female shrimp in 3 months. ('Shin Suisan Shimbun Sokuho,' Nov. 9, 1968.)



Malaysia

SABAH'S FISHING INDUSTRY IS GROWING

The Government of Sabah is transforming fisheries into a thriving and competitive industry. In 1968, M\$2.9 million (US\$960,000) were provided under a development plan for fisheries research and expansion. The government also allocated M\$95,000 (US\$31,000) for a pilot project for oyster and cockle culture to increase food production and improve the protein balance. If the project is successful, oyster and cockle culture will be introduced on a commercial scale and become an additional source of income for local fishermen.

Completed Projects

A Grant to Fish Cooperatives Scheme provides subsidies for local fishermen, including the outright grant of an outboard motor for every new fishing boat as well as modern fishing gear. During the first six months of 1968, Sabah fishermen received 72 outboard motors. The Fisheries Ministry has built 4 modern trawlers for gear experts to demonstrate modern trawling techniques to local fishermen.

Construction Underway

A training center for young fishermen, now being built on Labuan Island in eastern Sabah, should be completed by 1970 and a small fish waste factory for fish meal production is being built in Lahad Datu.

Future Plans

Plans have been made to improve fishing ports and to expand and modernize freezing and storage facilities. The Government also plans to build a fish cannery, and would welcome foreign participation in the project. The lack of canning facilities forced Sabah to import about M\$4 million (US\$1.3 million) worth of canned fish in 1967.

Freshwater Ponds

By the end of 1967, 1,135 freshwater ponds covering 143.5 acres had been built with government grants. During the first six months in 1968, another 60 ponds covering 22 acres were constructed.

Fishery Exports Rise

As a result of the Government's fisheries modernization and expansion, Sabah exported 2,300 metric tons of fishery products worth

M\$7.5 million (US\$2.5 million) in 1967, including some to the U.S. In 1967, fishery products were Sabah's third largest export after rubber and timber. In 1968, fishery exports may have been overtaken by palm oil, which has an extremely fast export growth rate. However, 1968 fishery export data, not yet known, may exceed those of 1967.

Manpower Problems

One of the major problems facing Sabah's fast growing fishing industry is manpower. In the past few years the industry has had trouble in recruiting, because young Malaysians prefer the easier life in the cities to the hard and tedious life at sea. The number of Sabah's fishermen, estimated at 8,000, has not increased substantially in recent years. (U.S. Consulate, Kuching, Jan. 3, 1969; 'Sabah Times,' Dec. 28, 1968; 'Japan Times,' Dec. 9, 1968.)



India

TO DEVELOP SHRIMP RESOURCES

Surveys of the shrimp resources off the coasts of India are continuing because there is considerable interest in further development. India's shrimp catch in 1967 was 98,000 metric tons.

Present Fishing Area

The total sea area between the Indian coast and 100 fathoms is approximately 108,000 sq. mi.; only a small fraction is presently exploited. The Continental Shelf is from 25-62 miles wide, but Indian shrimp fishing is confined to a narrow belt of about 9 miles.

Survey Results

Current surveys indicate that the largest shrimp are available at depths of 25 to 45 fathoms. Although many surveys have been made in adjacent waters by Indo-Norwegian Project, survey findings are available to Indian collaborators or Indian companies only.

Government Assistance

To assist in developing the shrimp industry, the Government intends to import 30-40 trawlers; 40-60 small trawlers are being built locally. Several American companies have considered investing in this fisheries development but have withdrawn from active participation for several reasons; however, some

India (Contd.):

American companies are still interested in investing in Indian fisheries. (U.S. Embassy, New Delhi, Jan. 10, 1969.)

* * *

SPINY LOBSTER FOUND
OFF KERALA COAST

India's spiny lobster fishery and exports are very small compared to other seafoods like shrimp. In 1967, India exported 128 metric tons of lobster, valued at US\$310,000. In 1966, she exported 81 tons worth US\$194,000. Six species of spiny lobster, Genus Panulirus, are found in India. The most important commercially is Panulirus homarus (Linn.) or Panulirus dasypus (Later.). Lobster occurs in almost all rocky coasts, but the Kanyakumari District of Madras State is the principal area. A few places north of Calicut also support the fishery to some extent. A larger lobster catch could form the basis of a valuable export trade. The fishery seems to be dwindling because of indiscriminate fishing. It may be necessary to impose size restrictions and prohibit catching of berried females.

The Indo-Norwegian Project (INP) has located a spiny lobster source in the deep-water regions off the Kerala coast. INP trawlers have caught mostly Parapandalus and other varieties of shrimp, but a fairly sizable quantity of the spiny lobster Puerulus sewelli has been found in the catches.

Puvur to Cochin Distribution

During 1958-63, the Kerala University Oceanographic Department, with R/V 'Conch,' surveyed the deeper waters beyond the 100 fathom line from Puvur (south of Trivandrum) to Calicut. Although the intensity and depths of the lobster population vary from place to place and year to year, the lobster bed is almost continuous at a depth beyond 100 fathoms, from Puvur in the south to Cochin in the north. The investigation was not carried out south of Puvur. Judging from the hydrographic conditions and nature of the substratum, it is likely that the species distribution also extends towards the south.

The length of the specimens collected by INP varied from 107 to 195 mm. (4.2-7.8 in.). Females were fewer in number, but most caught during January to April were berried. In live specimens the body was light orange with a slight reddish tint. Though other species of lobster, like Palinustus mossambica, Thenus orientalis, and Scyllaras sp. also were observed in the offshore regions in various types of substrata, they are not obtainable in sizable quantities and hence are not of economic importance.

INP success in obtaining good catches of both deep-water shrimp and lobster shows the urgent need for more detailed investigation of the new resources, and opens better scope for offshore fishing with large trawlers. ('Seafood Trade Journal,')



SOUTH PACIFIC

American Samoa

GOOD ALBACORE FISHING IN JANUARY

Albacore fishing was good off American Samoa in January 1969. Longliners were landing an average 1.2-1.3 tons and taking as much as 2 tons per set. The favorable fishing conditions and prices have raised fishermen's hopes. Frozen round albacore deliveries were bringing a new high of US\$415 a short ton.

About 14 Japanese, 20 South Korean, and 40-50 Taiwanese vessels were operating out of American Samoa. The growth of the Taiwanese fleet was attributed to the fact that the tuna fishing industry in Taiwan is government-backed. ('Katsuomaguro Tsushin,' Jan. 10, 1969.)



AFRICA

South Africa

FISHING INDUSTRY EXHIBITION
SLATED FOR OCT. 1969

'South African Shipping News and Fishing Industry Review' is sponsoring a fishing industries exhibition to be held in Cape Town, South Africa, Oct. 20-25, 1969. The exhibition will focus on the display and testing of new fishing equipment, gear, and scientific aids. Space has been reserved for foreign governments desiring to mount a national display.

Export Possibilities

The exhibition should offer excellent export-promotion opportunities for U.S. commercial fishing equipment manufacturers interested in the South African market. The area of greatest interest will be electronic fish-finding gear. Other attractive export possibilities are processing-plant equipment and preserving machinery for pilchards to be canned on shore. Interested U.S. firms should write to: South Africa Exhibition Organizers (Pty.) Ltd., P. O. Box 2900, Johannesburg, South Africa. (U.S. Consul, Cape Town, Oct. 18, 1968.)



South & South-West Africa

SHOAL FISH CATCH, JAN.-SEPT. 1968

The 1968 fishing season ended on Sept. 15; in 1967, it ran until Sept. 30.

South Africa's Sept. 1968 catch yielded 5,715 tons of fish meal and 65,436 imperial gallons of fish body oil. In South-West Africa, September production was 21,399 tons of fish meal and 4,440 long tons of fish body oil.

Shoal Fish Catch, January-September 1968				
Species	1968		1967	
	Jan.-Sept.	Sept.	Jan.-Sept.	Sept.
..... (Short Tons)				
South Africa:				
Pilchards	103,728	1,572	80,963	1,049
Maasbanker	1,507	-	9,427	-
Mackerel	99,325	-	153,071	-
Anchovy	187,165	23,272	304,060	33,530
Red-eye herring	14,908	-	13,973	-
Total	406,633	24,844	561,494	34,579
South-West Africa:				
Pilchards	730,828	64,310	724,710	65,650
Maasbanker	54	-	100	-
Anchovy	124,761	20,202	7,503	741
Total	855,643	84,512	732,313	66,391

In addition, the 2 South African factoryships operating off South-West Africa took 614,634 tons of pilchards; 47,942 tons were taken in September. ('The South African Shipping News and Fishing Industry Review,' Nov. 1968.)



WHY DOES THE SEA FOAM?

Foam is made up of air bubbles separated from each other by a film of liquid. Bubbles coming together in fresh water coalesce, but bubbles coming together in salt water bounce off each other.

Most bubbles in the ocean are caused by wind waves, but they may also be produced by rain and even snow. The bubbles that form along the seashore are very small, mostly less than $\frac{1}{2}$ millimeter in diameter.

When bubbles rise to the surface, they burst and release salt spray into the air, a fact well known to any wearer of glasses who has been on shipboard or at the seashore. Each bursting bubble causes a jet of several drops to rise to heights up to 1,000 times the bubble diameter. It is believed that most of the airborne salt nuclei come from bursting bubbles. ('Questions About The Oceans,' U.S. Naval Oceanographic Office.)

SALMON BLINTZES

Salmon Blintzes are just the thing to serve because they can be prepared ahead of time. An interesting combination of salmon and cottage cheese is blended with egg, spiced with cinnamon-sugar, then rolled in the blintzes and refrigerated until ready to use. Browned in butter just before serving and topped with sour cream and cherry or strawberry preserves for a sweet-sour taste, Salmon Blintzes will bring flavor perfection and the drama of the unusual to your entertaining. So get out the party hats and horns, the bells and candles--and have a party!



Salmon Blintzes

1 can (7 $\frac{3}{4}$ ounces) salmon	$\frac{1}{4}$ teaspoon cinnamon
1 cup cottage cheese	12 Blintzes
1 egg	1 cup sour cream
$\frac{3}{4}$ teaspoon salt	$\frac{1}{2}$ cup cherry preserves
2 tablespoons sugar	(or strawberry preserves)

Drain and flake salmon. Add cottage cheese, egg, sugar, salt, and cinnamon. Mix thoroughly. Place about 2 tablespoons of the salmon mixture on the browned side of each blintz. Spread the filling to within an inch of the edge. Fold the bottom edge of the blintz up about an inch over the filling. Fold the two sides of the blintz in about $\frac{3}{4}$ of an inch over the filling. Then finish rolling the blintz from the bottom. The blintzes may be made to this point and refrigerated until ready to use.

Place blintzes in a single layer in melted butter in a 10-inch fry pan. Fry at a moderate heat for 5 to 6 minutes or until brown. Turn carefully. Fry 5 to 6 minutes longer or until blintzes are brown. Drain on absorbent paper. Place 2 blintzes on a small plate. Top with sour cream and cherry preserves. Making 6 servings.

Blintzes

$\frac{3}{4}$ cup all-purpose flour	2 eggs, beaten
$\frac{1}{4}$ teaspoon salt	Oil
1 cup milk	

Combine flour and salt. Combine milk and eggs. Add gradually to flour mixture. Stir until smooth. Pour 2 tablespoons of batter into lightly oiled 6 inch fry pan. Tip the fry pan so that the batter completely covers the bottom. Fry at a moderate heat for 3 to 4 minutes or until blintz is brown on the bottom and set on top. Remove from pan. Makes 12 blintzes. (Source: Interior Department's BCF.)

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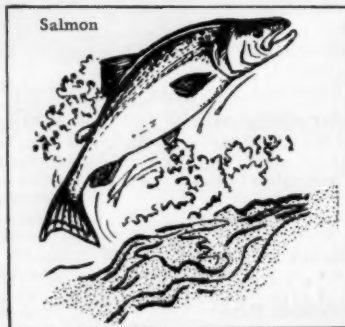
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SALMON

The anadromous Pacific salmon fisheries of the United States are of great importance from Bristol Bay, Alaska, to the Sacramento River, California. As early as 1829, settlers in the Northwest were salting and exporting salmon from the great runs up the Columbia River. By 1840 a few salting stations had been set up on Alaska shores, but salmon were first canned along the Sacramento River. By 1936, the peak year for the Pacific salmon fisheries, more than 100 canneries engaged in canning most of the 791-million-pound catch of U.S. fishermen.



In the years since, the Pacific salmon have been sharply reduced in number because of pollution, diversion and power dams, overfishing, and reduction of spawning grounds. Despite all this, salmon is still one of the most valuable fishery resources of the United States. The 310 million pounds caught in 1961 brought \$52 million to the fishermen, while the fishery products prepared by the processors were valued at over \$124 million. The commercial fishery for salmon is principally by purse seines, gill nets, beach seines, and by trolling.

Five kinds of salmon (known by a variety of names) come from Pacific waters: sockeye, chinook, coho, pink, and chum. Pacific salmon spend most of their lives in the ocean; when mature, they return to spawn in their home streams. Some go a short distance upstream, others go as much as 2,000 miles upstream to spawn; all die after they spawn. Months later the new generation emerges from the gravel. Some young make their way downstream to the sea immediately; others remain in fresh water for a year or two.

--Conservation Note 15, "Commercial Fisheries of the Pacific Coast," Fish and Wildlife Service, U.S. Department of the Interior.
(Available free from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.)

Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.



UNITED STATES DEPARTMENT OF THE INTERIOR

**U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES**



Home Economics Research



The Bureau of Commercial Fisheries maintains a National Home Economics Research Center (NHERC) at College Park, Maryland, to advise the fishing industry of current trends in the food field that may help to expand the use of fishery products. NHERC also advises the food trade on the availability, selection, and serving of fishery products. Research includes development of recipes for users such as schools, military establishments, other institutional operators, and individual consumers. Work is conducted to determine the nutritive value of prepared fishery products. The findings are distributed to industry, food trade associations, the public, State and Federal agencies--Departments of Agriculture, Defense, and Health, Education and Welfare--and national organizations, such as the American Home Economics Association, American Dietetic Association, and the American School Food Service Association.

The College Park facility and personnel are also used to train Bureau and State fishery home economists. For further information, contact the Bureau's National Home Economics Research Center, P.O. Box 128, College Park, Maryland 20740.

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